UN HABITAT
FOR A BETTER URBAN FUTURE

World Cities Report 2022

Envisaging the Future of Cities

World Cities Report 2022

Envisaging the Future of Cities

UN HABITAT
FOR A BETTER URBAN FUTURE

World Cities Report 2022

First published 2022 by United Nations Human Settlements Programme (UN-Habitat)

United Nations Human Settlements Programme (UN-Habitat)
P.O. Box 30030, Nairobi, Kenya
Website: www.unhabitat.org

DISCLAIMER

The designations employed and the presentation of the material in this report do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning delimitation of its frontiers or boundaries, or regarding its economic system or degree of development. The analysis, conclusions and recommendations of this report do not necessarily reflect the views of the United Nations Human Settlements Programme or its Executive Board.

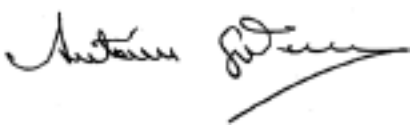
The Report is produced with official data provided by governments and additional information gathered by the Global Urban Observatory. Cities and countries are invited to update data relevant to them. It is important to acknowledge that data varies according to definition and sources. While UN-Habitat checks data provided to the fullest extent possible, the responsibility for the accuracy of the information lies with the original providers of the data. Information contained in this Report is provided without warranty of any kind, either express or implied, including, without limitation, warranties of merchantability, fitness for a particular purpose and non-infringement. UN-Habitat specifically does not make any warranties or representations as to the accuracy or completeness of any such data. Under no circumstances shall UN-Habitat be liable for any loss, damage, liability or expense incurred or suffered that is claimed to have resulted from the use of this Report, including, without limitation, any fault, error, omission with respect thereto. The use of this Report is at the User's sole risk. Under no circumstances, including, but not limited to negligence, shall UN-Habitat or its affiliates be liable for any direct, indirect, incidental, special or consequential damages, even if UN-Habitat has been advised of the possibility of such damages.

HS Number: HS/004/22E
ISBN Number(Series): 978-92-1-133395-4
ISBN Number: 978-92-1-132894-3

ISBN 978-92-1-132894-3
9 789211 328943

Secretary General's Foreword

António Guterres
Secretary-General of the United Nations



In 2016, the international community adopted the New Urban Agenda to harness the power of sustainable urbanization to achieve our global goals of peaceful, prosperous societies on a healthy planet.

Despite progress since then, the COVID-19 pandemic and other crises have posed huge challenges. Urban areas were particularly hard hit by the pandemic – underscoring the importance of stepping up efforts to build a more sustainable and equitable urban future.

Local is the space where we connect the dots. Cities and towns can spearhead innovations to bridge the inequalities gaps, deliver climate action and ensure a green and inclusive recovery from the pandemic – especially as the proportion of people living in urban areas is projected to grow to 68 per cent by 2050.

The *World Cities Report 2022* stresses that building resilience must be at the heart of the cities of the future. The success of cities, towns and urban areas will largely depend on policies that protect and sustain all, leaving no one behind. We need green investment for sustainable patterns of consumption and production; responsive and inclusive urban planning; the prioritization of public health; and innovation and technology for all.

These steps will help cities adapt and respond to shocks and stresses and lead our world to a resilient, just, and sustainable urban future.

Executive Director's Introduction

Maimunah Mohd Sharif
Under-Secretary-General and Executive Director
United Nations Human Settlements Programme
(UN-Habitat)

In February 2020, as UN-Habitat announced that the 2022 World Urban Forum will be hosted by Poland in the city of Katowice, we could not imagine that the world would go into lockdown. The COVID-19 pandemic created a temporary crisis of confidence in the future of cities as urban dwellers across the world, especially in large cities, fled to the perceived safety of the countryside or to smaller towns.

At the peak of the pandemic, what were once bustling cities became desolate as residents disappeared from public spaces during enforced lockdowns. Today, in 2022, many cities have begun to resemble their old selves, cautiously returning to the way they operated previously. There is a broad consensus that urbanization remains a powerful twenty-first century mega-trend. A sense of optimism is returning that the pandemic is providing us with the opportunity to build back differently. Can our children inherit an urban future that is more inclusive, greener, safer and healthier?

If the world were to experience another pandemic or major threat, would our cities and towns be sufficiently prepared based on what we have learned over the last two years? Would our cities have developed a robust system of resilience to respond to and withstand future shocks? I recall mayors and city managers asking: how do we build back better, greener and inclusively?

The answer lies with what we have learned and adopted as best practices responding to COVID-19 and the climate crisis. We must start by acknowledging that the status quo leading up to 2020 was in many ways an unsustainable model of urban development. To meet this challenge, the future of cities must respond to pressing urban challenges in different parts of the world. An optimistic scenario of urban futures will reduce inequality and poverty, foster productive and inclusive urban economies, invest sustainably to promote clean energy and protect ecosystems, and prioritize

The vision of sustainable and equitable urban futures will not be guaranteed unless cities and subnational governments take bold and decisive actions to address both chronic and emerging urban challenges

public health. These ambitions, in turn, must be facilitated by responsive urban planning and multilevel governance systems in which finance, innovation and technology play overarching roles.

While the COVID-19 pandemic has occupied a significant share of global attention since 2020, it is far from the only threat facing the future of cities. High inflation and unemployment, slow economic growth, looming recession, mounting public debts, supply chain disruptions, armed conflicts, and a global food and energy crisis amount to a bitter cocktail of contemporary challenges. Unless concerted action is taken, millions of poor and vulnerable families across the world will continue to live in a future that is unfolding without the necessary safeguards and one that eclipses their dreams of a better urban future. Building economic, social and environmental resilience, including appropriate governance and institutional structures, must be at the heart of the future of cities. Economic resilience with new fiscal sustainability frameworks, societal resilience with universal social protection schemes, climate resilience with greener investments, and stronger multilevel collaboration to confront future shocks must be the main building blocks of a resilient future that can withstand and respond to the various threats and shocks that urban areas face.

The World Cities Report 2022 envisages an optimistic scenario of urban futures that relies on collaborative and effective interventions to tackle multidimensional poverty and inequalities; promote vibrant, resilient, diversified urban economies and productive urban futures; build healthy and thriving cities; strengthen the drive towards green urban futures; promote well-planned and managed urbanization processes; and ensure inclusive digital economies for the future. The optimistic scenario envisions concerted policy action facilitated by the implementation of the New Urban Agenda. It has now been over five years since the New Urban Agenda was adopted at the Habitat III summit in 2016 and the implementation framework must be amplified to achieve the Sustainable Development Goals by making transformative progress in addressing the multiple challenges confronting cities both now and in the future.

The Report reaffirms that the vision for the future of cities must embody the "new social contract" in the form of universal basic income, universal health coverage and universal housing and basic services. This proposal was first articulated in the 2021 UN-Habitat report Cities and Pandemics: Towards a More Just, Green and Healthy Future and remains more urgent than ever.

The vision of sustainable and equitable urban futures will not be guaranteed unless cities and subnational governments take bold and decisive actions to address both chronic and emerging urban challenges. Without urgent and transformative policy action at all levels, the current situation will only get worse. The urgency of new approaches for transformative change in cities cannot be overemphasized. Within this Decade of Action window, it is urgent for cities and subnational governments to adopt innovative approaches that will foster the optimistic scenario of urban futures.

The New Urban Agenda provides a holistic framework for urban development that encourages the integration of all facets of sustainable development to promote equality, welfare and shared prosperity. Our cities and towns must mainstream these commitments in their local development plans with a deliberate focus on tackling inequality, poverty and climate change, among other challenges. Sustainable urban futures remain a cornerstone of the fight to ensure that cities are better prepared for the next crisis.

Acknowledgements

Authors: UN-Habitat Core Team
Neil Khor (Division Director); Ben Arimah (Chief of Unit and Task Manager); Raymond Otieno Otieno; Matthijs van Oostrum; Mary Mutinda; Judith Oginga Martins

Authors: External
Godwin Arku; Vanesa Castán Broto; Merlin Chatwin; Lewis Dijkstra; Simon Joss: Ayyoob Sharifi; Alice Sverdlik; David Simon; Pietro Florio; Sergio Freire; Thomas Kemper; Michele Melchiorri; Marcello Schiavina; Alfredo Alessandrini; Fabrizio Natale; Daniela Ghio; Olivier Draily; Linda Westman; Ping Huang; Enora Robin; Hita Unnikrishnan

Statistical Annex
Robert Ndugwa; Donatien Beguy; Dennis Mwaniki; Julius Majale; Amos Thairu; Kevin Nyamai; Edwin Kochulem; Daniel Githira; Linda Mwongeli; Martin Runguma; Carol S. Akoth.

Contributors: UN-Habitat Staff
Raf Tuts; Robert Ndugwa; Donatien Beguy; Dennis Mwaniki; Remy Sietchiping; Shipra Narang Suri; Paula Pennanen-Rebeiro-Hargrave; Paulius Kulikauskas; Katharina Rochell; Xing Quan Zhang; Chris Williams; Filiep Decorte; Anne Amin; Rafael Forero; Maria Tellez Soler; Angela Mwai; Cecilia Andersson; Lucia Kiwala; Stefanie Holzwarth; Janene Tuniz; Rosa Muraguri-Mwololo; Graham Alabaster; Isabel Wetzel; John Omwamba; Lennart Fleck

Contributors: External
Susan Parnell; James Duminy; Elmond Bandauko; Karen Vankerkoerle; Maximilian Kriz; Jasmin Cook; Roberto Rocco; Abdellah Abarkan; Oliver Lah; Nathalie Roebbel

Administrative Support Team
Caroline Gaceru; Brenda Gacheru; Nelly Kang'ethe; Shova Khatry

IT Support for Expert Group Meetings
Leon Osong; Moshy Savegod

International Advisory Board
Christine Platt; John Ebohon; Taibat Lawanson; Yu Zhu; Matt Benson; Nikolai Bobylev; Ryan Centner; Bharat Dahiya; Carol Archer

Financial Support
Government of Sweden
Ministry of Development Funds and Regional Policy, Government of Poland
Abu Dhabi Department of Municipalities and Transport, United Arab Emirates

Editorial Consultant
Gregory Scruggs

Communications and Media Team
Katerina Bezgachina; Victor Mgendi; Ivy Mutisya

Design and Layout: Peter Cheseret; Michael Lusaba
Creative Direction: Andrea Posada
Illustrations: Ana María Ospina
Web Development: Andrew Ouko, Joshua Gichuhi

Contents

List of Boxes, Figures, Maps and Tables

List of Boxes

List of Figures

List of Maps

List of Tables

Acronyms and Abbreviations

€	Euro
£	Sterling pound
ABC	Ahorro, Bono y Crédito (Savings, Bond and Credit)
AI	artificial intelligence
AMVA	Metropolitan Area of Valle de Aburrá
ASEAN	Association of Southeast Asian Nations
ASI	avoid-shift-improve
AU$	Australian dollar
B3W	Build Back Better World
BREEAM	Building Research Establishment Environmental Assessment Method
BRICS	Brazil, Russia, India, China and South Africa
BTI	Bertelsmann transformation index
CASBEE	comprehensive assessment system for built environment efficiency
CAV	connected and autonomous vehicles
CDC	Centers for Disease Control and Prevention
CFRS	city-region food systems
CHW	community health worker
COPD	chronic obstructive pulmonary disease
COVID-19	coronavirus disease 2019
CRI	city resilience index
DALY	disability adjusted life year
EU	European Union
EV	electric vehicle
FAO	Food and Agriculture Organization
FDI	foreign direct investment
G20	Group of 20
GBI	green-blue infrastructure
GCP	gross city product
GDP	gross domestic product
GHG	greenhouse gas
GIZ	Gesellschaft für Internationale Zusammenarbeit
GTA	Greater Toronto Area
HHI	Herfindahl-Hirschman index
HIA	health impact assessment
HiAP	health in all policies
ICLEI	Local Governments for Sustainability
ICT	information and communications technology
IEA	International Energy Agency
IHD	ischaemic heart disease
ILO	International Labour Organization
IoT	internet of things
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
ITDP	Institute for Transportation and Development Policy
JRC	Joint Research Centre
LEED-ND	Leadership in Energy and Environmental Design - Neighborhood Development

LGBTQI	lesbian, gay, bisexual, transgender, queer and intersex
MENA	Middle East and North Africa
MERS	Middle East respiratory syndrome
NBSs	nature-based solutions
NCD	non-communicable disease
NGO	non-governmental organization
NIMBY	not-in-my-backyard
NUA	New Urban Agenda
NUP	national urban policy
NZED	net zero-energy districts
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of Petroleum Exporting Countries
PPP	public-private partnership
PrEP	pre-exposure prophylaxis
PSUP	Participatory Slum Upgrading Programme
R&D	research and development
SARS	severe acute respiratory syndrome
SDGs	Sustainable Development Goals
SDI	Shack/Slum Dwellers International
SMEs	small and medium-sized enterprises
SPA	special planning area
sq. km	square kilometre
SSA	Sub-Saharan Africa
SUFF	Sustainable Urban Futures Fund
SUMP	sustainable urban mobility plan
TfL	Transport for London
TMNs	transnational municipal networks
UBI	universal basic income
UCLG	United Cities and Local Governments
UHC	universal health coverage
UITP	International Association of Public Transport
UK	United Kingdom of Great Britain and Northern Ireland
UNCDF	United Nations Capital Development Fund
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nationals Environmental Programme
UNFCCC	United Nations Framework Convention for Climate Change
US	United States of America
US$	United States dollar
VLR	voluntary local review
WASH	water, sanitation and hygiene
WEF	World Economic Forum
WHO	World Health Organization
WIEGO	Women in Informal Employment: Globalizing and Organizing

Key Findings and Messages

Chapter 1

The Diversity and Vision for the Future of Cities

While the COVID-19 pandemic dominated the two years between editions of the World Cities Report and upended many aspects of urban life, this Report comes at a time when world events create ever more dynamic environments for urban actors. Although most of the world has lifted the public health restrictions and border closures that made COVID-19 such a dominant aspect of urban life, the virus continues to flare up periodically and some countries still have strict measures in place. Recently, the world has witnessed a sudden global spike in inflation and cost of living, alongside supply chain disruptions, which is severely affecting the recovery of urban economies. New and persistent armed conflicts have altered the geopolitical order and contributed to global economic uncertainty.

The disruptive nature of the COVID-19 pandemic is a stark reminder that urban areas need to be prepared for dynamic and unpredictable futures. Cities across the world were totally unprepared for the magnitude of the economic and social impacts of the pandemic. The pandemic revealed and amplified long-standing weaknesses in the social structure of cities, resulting in disproportionate impacts on vulnerable and marginalized groups. Key lessons emerging from the COVID-19 pandemic are that urban areas must invest in preparedness, which requires developing the economic, social, environmental and institutional resilience to respond to a wide range of shocks, including having contingency plans for the most vulnerable groups.

The foregoing raises key questions about the future of cities. What kind of cities do we envisage and reimagine in the aftermath of the pandemic? What kind of cities are needed to support humanity in a predominantly urban world? How do cities prepare for an uncertain world? Building economic, social and environmental resilience, including appropriate governance and institutional structures, must be at the heart of the future of cities. To meet this challenge, sustainable urban futures must prioritize reduction in poverty and inequality; foster productive and inclusive urban economies that provide opportunities for all; adopt environmental policies and actions that mitigate and adapt to climate change, promote clean energy and protect ecosystems; integrate public health into urban development; – facilitated by responsive urban planning and governance systems in which with finance, innovation and technology play overarching roles.

Key Findings

Cities are here to stay, and the future of humanity is undoubtedly urban: The experience in the early days of the COVID-19 pandemic, when some residents fled large cities was a temporary response that will not fundamentally change the course of global urbanization. We are witnessing a world that will continue to urbanize over the next three decades—from 56 per cent in 2021 to 68 per cent in 2050. This translates into an increase of 2.2 billion urban residents, living mostly in Africa and Asia. All regions of the world are expected to become more urbanized, although highly urbanized and more developed regions are expected to stabilize or experience a decline in urban growth. Unequivocally, this tells us that cities are here to stay, and that the future of humanity is undoubtedly urban, but not exclusively in large metropolitan areas.

The future of cities is not uniform across regions and can lead to a range of scenarios: While responding to climate change vulnerability and rising levels of inequality are global concerns, other issues are bifurcated by region. In developed countries, the key priorities for the future of cities also include managing cultural diversity, upgrading and modernizing ageing infrastructure, addressing shrinking and declining cities, and meeting the needs of an increasingly ageing population. In developing countries, urban priorities for the future are rising levels of poverty, providing adequate infrastructure, affordable and adequate housing and addressing challenge of slums, high levels of youth unemployment, and investing in secondary cities. How these challenges are addressed will lead to a range of future scenarios.

The worst-case scenario of urban futures is that of high damage: In a high damage scenario, extreme poverty could increase by 32 per cent or 213 million by 2030. Under this scenario, the impacts of the ongoing COVID-19 pandemic

as well as global economic uncertainties, environmental challenges, and wars and conflicts in different parts of the world could have long-term impacts on the future of cities. For instance, cities in Africa could lose up to two-thirds of their financial resources and the weak urban service delivery and governance systems in some of these cities could collapse. If global action against multiple urban challenges fails and this bleak scenario becomes a reality, the credibility of the multilateral system would be compromised, thereby undermining coordination efforts to address urgent and pressing global issues.

Business as usual will result in a pessimistic scenario: Returning to the pre-pandemic state of affairs, also known as the Bad Old Deal, is characterized by the systemic discrimination and exclusion of the poor in urban agendas including the exclusion of informal sector workers, overreliance on fossil fuels, poorly planned and managed urbanization, low prioritization of public health in urban development, and entrenched digital inequalities, which collectively undermine the vision of achieving inclusive, resilient, and sustainable cities where no one is left behind. Globally, 1.6 billion people or 20 per cent of the world's population live in inadequate housing, of which one billion reside in slums and informal settlements. Under these conditions, the goal of eradicating poverty in all its forms by 2030 and leave no one behind will not be achieved. Without concerted efforts, the pessimistic scenario could lead to new forms of urban vulnerabilities in the future that would disproportionately affect already disadvantaged and vulnerable groups.

Changing course to a sustainable path can lead to an optimistic scenario: With concerted policy action through the effective implementation of the New Urban Agenda as a framework for achieving the SDGs, it is possible for cities to avoid either of the high damage or pessimistic scenarios and instead emerge into a more optimistic future. This scenario involves collaborative, well-coordinated and effective multilateral interventions to leverage the opportunities and address the challenges of urbanization. With appropriately implemented measures, the response to the current urban crisis can lead to a collective reprioritization of cities across the world towards shared prosperity and inclusion.

Key Messages

Urbanization is intertwined with several existential global challenges: Cities do not exist in isolation from global challenges. The emergence of urbanization as a global mega-trend is intertwined with the existential challenges that the world has faced in the last 50 years, including climate change, rising inequality and the rise in zoonotic viruses with the latest being the novel coronavirus pandemic, which triggered the worst public health crisis in a century and the worst economic recession since the Great Depression. These challenges will in different ways, leave their imprints on the future of cities.

Building resilience must be at the heart of the future of cities: Building economic, social and environmental resilience, including appropriate governance and institutional structures, must be at the heart of the future of cities.

Economic resilience with new fiscal sustainability frameworks, societal resilience with universal social protection schemes, climate resilience with greener investments and stronger multilevel collaboration to confront future shocks must be the building blocks of a resilient urban future.

Urban areas need to be prepared for dynamic and unpredictable futures: The disruptive nature of COVID-19, supply chain disruptions, high inflation, climate change and armed conflicts are all reminders that urban areas need to be prepared for an ever-changing and unpredictable future. Our urbanizing world must be adequately equipped for effective response to a broad range of shocks, and at the same time, transition to more sustainable, just, green, resilient and healthy futures. Global threats require concerted action, which can only be achieved in the spirit of solidarity and cooperation, as no single government or multilateral agency can address such threats alone.

Any vision for an optimistic future of cities must embody a new social contract with universal basic income, health coverage and housing: Following the disruptions wrought by the COVID-19 pandemic, an emerging vision for an optimistic future in cities is one that embodies a new social contract in the form of universal basic income, universal health coverage and universal housing and basic services. The emerging vision should seek to make cities more equitable, one that is greener and more knowledge-based and is resilient across multiple dimensions.

Localizing the New Urban Agenda and SDG 11 is the most promising pathway to the optimistic scenario of urban futures: The global impacts and disruption triggered by the coronavirus pandemic, much of which played out in urban areas, have simply added a sense of urgency and the demand for a change to some of the unsustainable practices in the journey towards more sustainable urban futures. The path to sustainable urban futures will be determined by inclusive and transformative policies to eradicate poverty and inequality; produce urban economies that provide opportunities for all; generate greener investment for sustainable consumption and production patterns; set the framework for responsive urban and territorial planning; implement collaborative and integrated systems of urban governance; prioritize public health; deploy inclusive innovation and technology; and build resilience, which enables cities to respond to and withstand a wide range of shocks. The localization and effective implementation of the New Urban Agenda serves as a framework for integrating the interrelated components that constitute these pathways.

Chapter 2

Scenarios of Urban Futures: Degree of Urbanization

A new harmonized definition, called the Degree of Urbanization, facilitates international comparisons of urbanization. By defining three main classes of human settlements (cities, towns and semi-dense areas, and rural areas), the Degree of Urbanization captures the urban-rural continuum as recommended by research. It provides a pathway to overcoming the fundamental challenge linked to monitoring urban trends and the development agendas that has lingered over the years: the lack of a unified definition of what constitutes "urban" and its precise measurement.

This chapter provides a unique perspective on future trends using Degree of Urbanization and data emanating from this new harmonized approach. Specifically, it provides scenarios that allow us to understand the anticipated demographic and spatial changes across the urban-rural continuum in various regions as well as their drivers.

Key findings

Fast-paced global growth in city population is behind us and a future slowdown is in the offing across the urban-rural continuum: New research using the harmonized definition "Degree of Urbanization" indicates that demographic growth has already started to slow down and is projected to continue over the coming decades. While the city population share doubled from 25 per cent in 1950 to about 50 per cent in 2020, it is projected to slowly increase to 58 per cent over the next 50 years. The share of other settlements in the urban-rural continuum (towns and semi-dense areas as well as rural areas) is expected to decrease; towns and semi-dense areas are expected to drop to 24 per cent (from 29 per cent in 2020) and that of rural areas to 18 per cent (from 22 per cent).

A slowdown does not indicate no growth—the population of cities in low-income countries is projected to grow nearly two and a half times by 2070: Low-income countries have much higher absolute and relative city population growth than higher income countries. From 1975 to 2020, their city population grew fourfold to about 300 million. By 2070, their population is projected to exceed 700 million. Additionally, projections show that, between 2020 and 2070, the number of cities in low-income countries will grow far more than in the rest of the world—an increase of 76 per cent, compared to 6 per cent in upper-middle-income

countries. High-income and lower-middle-income countries will see an increase of about 20 per cent.

Most expansion of city land area will occur in low-income countries—without effective planning, urban sprawl might become a low-income country phenomenon: The new data show that changes over the next five decades—in terms of growth of city land area from 2020 levels—will mostly take place in low-income countries (141 per cent), lower-middle-income (44 per cent) and high-income countries (34 per cent). Changes in upper-middle-income countries is projected to be relatively small (13 per cent). This growth is projected to be highest in Oceania and Sub-Saharan Africa, where it is estimated to (almost) double. Growth in city land will be relatively lower in Eastern and South-Eastern Asia (10 per cent), Latin America and the Caribbean (14 per cent) and Europe (16 per cent).

Small cities and towns remain critical to achieving sustainable urban futures in low-income countries: Small cities (less than 250,000 inhabitants) cover almost half of city land (about 45 per cent) in low-income countries, a trend that will persist over the coming decades. Therefore, adequate territorial planning and enhanced capacities in these settlements can strengthen the pivotal role they play in realizing sustainable futures in these countries.

Key Messages

Managing city density is the key future sustainability challenge for low-income countries: While density scenarios play out differently cities in various regions of the world, the fast-paced growth in city population in low-income countries sets them apart. City densities in these countries need to be planned for and managed in ways that do not exert pressure on existing open land, infrastructure and services, resulting in crowding on one hand or leading to unsustainable sprawl on the other. In these countries, a high-density scenario, for instance, would see the already high population density in cities reach 14,000 by 2050 while a low-density scenario would mean cities need five times the amount of land to accommodate growth. In contrast, growth in city population in upper-middle- and high-income countries is lower and cities are less dense. As a result, they can accommodate future growth of population without any need to increase the amount of land. In some cases, the amount of city land is projected to shrink, such as in Eastern Asia.

Enhanced planning capacities are needed in low-income countries, especially for smaller and new cities: Urban and territorial planning that is responsive, anticipates and effectively addresses the demand for city expansion is imperative for sustainable futures in low-income countries. City land in these countries is projected to increase nearly one and a half times over the next 50 years. Notably, a significant share of this expansion will come from smaller and new cities, which may struggle to plan for this growth. Enhanced capacities in these settlements will strengthen the important role they play across the urban-rural continuum in achieving sustainable futures.

Various levels of government need to plan for greying cities and towns: Demographic changes mean that in the future cities will have a larger share of elderly and a smaller share of children. It is therefore vital to plan for age-friendly cities and towns that afford good quality of life for all its inhabitants across all generations. Already, the ageing of population is a reality in urban areas of high- and upper-middle-income countries.

Urbanization is inevitable, planning for urban growth is critical for sustainable futures: Effective urban and territorial planning is critical to mitigate the negative social, economic and environmental associated with future urban growth. The growth of city land in low-income countries, for instance, will require substantial efforts in terms of both planning and infrastructure investments. Planning should be undertaken ahead of this expansion of cities to halt informality and ensure that there is policy coherence at various scales guiding the needed investments.

Chapter 3

Poverty and Inequality: Enduring Features of an Urban Future?

Cities generate wealth but also concentrate poverty and inequality. From the overcrowded slums in the developing world to homelessness and pockets of destitution in the developed world, urban poverty and inequality take many forms. We cannot envision a bright future for cities when inequality appears to be on the rise globally and poverty in certain regions. How to tackle poverty and inequality are among the most pressing challenges facing urban areas; and improving income and a wide range of opportunities for all is essential to achieving an optimistic urban future. The global development agenda gives prime of place to the issue, with SDG 1, which calls for a world in which we "end poverty in all its forms everywhere." If urban poverty is not addressed, then this goal will remain elusive.

Key Findings

Urban poverty and inequality remain one of the most intractable challenges confronting cities: Urban poverty and inequality are highly complex and multidimensional challenges whose manifestation go beyond lack of income. Urban poverty and inequality are intertwined; they reinforce each other to create conditions of disadvantage that constrain the poor from enjoying the benefits of sustainable urbanization. The multidimensionality of urban poverty and inequality should be at the centre of interventions to create inclusive and equitable urban futures globally.

Without concerted action at all levels, poverty and inequality could become the face of the future of cities: Poverty and inequality are increasingly becoming pervasive in our cities. In developing countries, slums and informal settlements are the most enduring spatial manifestation of poverty and inequality. For the millions living in slums, access to essential services remains elusive; thus, preventing the realization of a better urban future. In cities of developed countries, pockets of poverty and destitution have become entrenched, where minority groups endure marginalization and stigmatization coupled with underinvestment in urban infrastructure. If decisive actions are not taken, urban poverty and inequality will become endemic.

Most countries in Sub-Saharan Africa are off-track from ending poverty by 2030: Most countries in Sub-Saharan Africa are off-track in achieving the goal of ending poverty by 2030. The region has the highest incidence of urban poverty globally with about 23 per cent of the urban population living below the international poverty line and 29 per cent experiencing multidimensional poverty. The rate of multidimensional urban poverty in Sub-Saharan Africa is 11 times higher than in Latin America and the Caribbean. Indeed, poverty is on the rise in close to one-third of the countries in Sub-Saharan African. Unless governments at all levels act decisively, poverty could become an entrenched feature of the future of cities in the region.

The COVID-19 pandemic has resulted in the emergence of newly poor people: The COVID-19 pandemic has reversed years of remarkable progress made in the fight against poverty. The pandemic has resulted in the emergence of newly poor people—that is, those who would have exited poverty in the absence of the pandemic but remain poor; and those who have fallen into poverty on account of the pandemic. In 2020, the pandemic-induced new poor globally was between 119 and 124 million people; this is projected to have risen to between 143 and 163 million in 2021. A majority of the new poor will be living in urban areas; thereby, presenting additional burden to already overstretched local governments especially in developing countries.

Key Messages

Tackling urban poverty and inequality are urgent global priorities: The current COVID-19 pandemic is a reminder that the vision of equitable urban futures will not be achieved unless cities and subnational governments take bold actions to address the pervasive presence of urban poverty and inequality. Without urgent and transformative policy action at all levels, the current situation will only worsen. The long-term costs of each incremental policy choice may not be clear, but each decision could shape the future of cities for generations. Wrong decisions by city leaders could entrench poverty, deny opportunity for millions and widen urban disparities in ways that will become increasingly difficult to reverse.

A multidimensional approach is key to an inclusive urban future: Within the Decade of Action window (2020-2030), cities and subnational governments should adopt a multidimensional approach to addressing poverty and inequality by investing in infrastructure and essential services, while addressing the multiple spatial, social and economic barriers that foster exclusion. Narrow, sectoral approaches have proved ineffective amid the social, economic, political,

and environmental crises that trap most residents in poverty. As part of building sustainable urban futures, the following dimensions are critical: spatial dimension—access to land, housing, and infrastructure; social dimension—rights and participation; and economic dimension—opportunities for all. Collectively, these factors can lift millions of people out of poverty and create more equitable and inclusive urban futures.

Governments must extend infrastructure and urban services to underserved communities: Investing in and extending infrastructure and services to deprived urban neighbourhoods is a critical policy lever to address poverty and inequality. Access to water and sanitation can be a matter of life and death for poor urban dwellers. Targeting improvements in quality, coverage and affordability to zones of disadvantage and poverty should be a matter of policy priority. If these transformative measures are implemented, they can change the current negative trends and galvanize actions towards achieving equitable, inclusive and resilient urban futures.

Supporting informal employment is critical for building inclusive urban futures: Informality is a reality of urbanization especially in developing countries. Looking into the future, cities should halt the exclusion of informal sector workers in all spheres of urban endeavour. Cities and subnational governments should acknowledge the legitimate contributions of informal workers and stop their harassment and penalization. The rights of informal workers should be guaranteed. These rights include legal recognition, economic and social rights, access to essential services and better representation in policymaking. Cities will not be able to offer a bright urban future if their informal sector workers are perpetually excluded from urban development processes.

Gender transformative approaches are crucial for building inclusive urban futures: Going forward, cities and subnational governments should prioritize inclusive and gender-transformative responses that are co-produced with vulnerable urban populations. Cities should focus on developing inclusive urban governance processes that promote transformative resilience to multiple risks by using local knowledge in the face of uncertainty. Urban leaders should draw on grassroots, civil society and private-sector efforts and build local alliances to deliver more effective strategies and co-design solutions to urban poverty and inequality.

Chapter 4

Resilient Urban Economies: A Catalyst for Productive Futures

The urban economy is integral to the future of cities. Given the size of the contribution of cities to the national economy, the future of many countries will be determined by the productivity of its urban areas. People first gathered in denser human settlements for the purpose of trading at markets, and this fundamental aspect of urban life has evolved over time. Today's urban economies are complex systems tied to global trade and capital flows, in which foreign entities can own the property next door and distant events can affect the prices for local goods. Cities must be smarter than ever about how they position their economies for the maximum benefit of all residents while also safeguarding the environment and improving their city's quality of life.

Key Findings

When planning their economic future, cities cannot overlook the informal sector: Recognizing and supporting the informal sector is vital for urban economic resilience and productive urban futures, particularly in developing countries. Given the contribution of the informal sector, cities should adopt a transformative urban economic agenda that is inclusive and equitable. Approaches to urban planning, governance and international development should be reformed to make them responsive to the needs of informal sector workers. This should be backed by the necessary support mechanisms such as access to finance (and relief during crises), markets and infrastructure to boost the resilience of informal economy actors to shocks and strengthen their contribution to productive urban futures.

Future economic growth and resilience cannot be sustained without bridging the infrastructure gaps across the urban-rural continuum: Cities and subnational governments should prioritize infrastructure investments towards building resilient urban economies and prosperous urban futures. This includes targeting underserved neighbourhoods such as slums and informal settlements and marginalized neighbourhoods who bear the brunt of underinvestment in infrastructure. Investments should also be directed towards transport infrastructure systems to enhance the competitiveness of cities and enable urban productivity.

Sustainable urban and territorial planning supported by effective governance structures is critical for building resilient urban economies and productive urban futures: In developing countries, more focus should be on institutional capacity building to enable sustainable planning and management of urban development. Cities that are well planned and managed perform better in optimizing and reaping the benefits of economies of agglomeration. If cities continue to grow in a disconnected and fragmented manner, the opportunities of leveraging economies of scale and urban agglomeration will be missed.

Sustainable and innovative municipal finance is fundamental: Cities must diversify their revenue sources by mobilizing sustainable, innovative and resilient revenue sources. The COVID-19 pandemic has shown that overreliance on traditional revenue sources like property taxes could have potentially crippling effects on the fiscal health of cities. Revenue mobilization should be back by institutional reforms to grant cities adequate fiscal autonomy to experiment with new financing instruments such as land value capture and municipal bonds, as well as to provide them leverage to reform their tax systems in line with their economic bases. These innovative financing instruments (especially when aligned with sustainability ambitions) can serve as important levers to catalyse economically impactful capital investments that create long-term value for citizens, businesses and the city as a whole; thus, contributing to resilient and productive urban futures.

Key Messages

Economic diversification is a critical pillar for urban economic resilience and productive urban futures: The New Urban Agenda encourages governments to prioritize economic diversification by progressively supporting the transition to higher productivity through high-value-added sectors, technological innovations and creating quality, decent and productive jobs. In order to withstand future shocks and stresses, cities should utilize existing and potential resources to diversify their economies. Diversification of urban economies should be supported by targeted investment and strategies to shift production structures towards new sources of growth. Failure to diversify urban economies will make cities extremely vulnerable to future shocks, especially in developing regions and in cities that heavily depend on single industries such as tourism, manufacturing or natural resource extraction.

Cities should embrace the circular economy as a new frontier in the pursuit of sustainability and resilience: The New Urban Agenda promotes the adoption of policies that lead to a circular urban economy in order to move consumption and production away from unsustainable patterns. Gazing into the future, cities must facilitate and promote greener recovery for resilient economies. Adopting the circular economy can potentially generate additional decent and productive jobs, which are catalysts for urban productivity.

Measures to achieve balanced and integrated urban and territorial economic development must be put in place today to avert skewed development tomorrow. In line with the call of the New Urban Agenda for balanced urban and territorial development, cities and subnational governments should put in place measures to ensure that economic growth is equitable across territories. Full implementation of national urban policies should be a priority. Other measures could include targeted infrastructure investments in secondary and intermediate cities that have been left behind. This focus will enhance the competitiveness of secondary cities, set their economies towards sustainable growth and build resilience to future shocks.

The accelerated pace of transformation in the world of work calls for continual talent and skills development to achieve urban economic resilience and productive futures: Cities should focus on investing in human capacity development to build skills and competences that are in sync with rapid transformations taking place and the emerging new urban economy. Developing skills and talent for human capital is vital for inclusive and sustainable urban growth as it aligns with SDG 8 on promoting productive employment and decent work for all. The new urban economy requires re-skilling of workers to adapt to technological changes. A well-trained workforce is a prerequisite for resilient urban economies and productive urban futures.

Chapter 5

Securing a Greener Urban Future

Climate change and environmental concerns increasingly dominate future scenarios. The increase in extreme weather events and natural disasters like flooding, heatwaves and landslides will impact urban areas the hardest, which makes climate change adaptation a paramount concern. Meanwhile, urban areas are responsible for the majority of the world's carbon emissions. As such, the transition to net zero greenhouse gas emissions must occur as soon as feasibly possible. Cities can do their part by embracing a wide range of options.

Key Findings

The transition to net zero GHG emissions has been marked by a lack of ambition and policy pitfalls: There has been a growth of interest in net zero policies to facilitate sustainability transitions at the local level. However, current net zero policies have pitfalls, including an overreliance on underdeveloped technologies that overlook local resources and the lack of integration of local governance strategies in national programmes for action. Meanwhile, the lack of ambition in the current national commitments to net zero also echoes a lack of imagination in defining alternative urban futures.

The twin crises of climate change and the loss of global biodiversity threaten the futures of cities: Climate impacts and other environmental crises interact with drivers of urban inequality, affecting people's capacity to anticipate the impact, then respond and recover from them. Dealing with future risks—including environmental risks— has become one of the main concerns for local governments and other urban-based actors, eliciting diverse responses.

Inclusive spaces to deliver green urban futures are necessary for sustainability transitions: There are many cases where significant infrastructure and transport projects are accomplished at the expense of various social groups in urban areas, in some cases entrenching existing inequalities and vulnerabilities. Transition and resilience agendas foreground the need to align social and environmental justice goals with the policy priorities of the SDGs and the New Urban Agenda. The interaction between global and local partnerships is further making broader inclusion possible. Additionally, there are also growing opportunities for collective action to deliver low carbon and resilient urban futures at the local level.

The world is losing the opportunity to use the post-pandemic context as a catalytic moment to facilitate investment for a transition to net zero carbon emissions: While the COVID-19 pandemic represented a significant setback in achieving poverty reductions and the SDGs, it presented a potential inflection point for change toward sustainability. However, the window of opportunity opened by the crisis to rethink human-environmental relations and mobilize recovery funds for environmental sustainability is closing rapidly, with carbon emissions again soaring and the extinction crisis unabated.

Greener futures cannot be secured without just transitions: Alongside new technical possibilities to facilitate resource efficiency in sectors such as energy and transport, urban policies must recognize how the informal sector serves the needs of many urban residents. A well-documented example is informal motorized and non-motorized transport that serve many disadvantaged communities in urban areas. A just transition will need to incorporate the concerns of this sector, alongside technological improvements. Urban planning must be inclusive to effectively cater for the informal services sectors that work for the urban poor.

Key Messages

Policymakers at all levels must recognize and support the role of urban areas in the net zero transition: Besides actions at the national level, achieving net zero is also dependent on subnational and city-level action. There is, therefore, a need to develop policies to support action at the subnational level, limiting carbon emissions or reducing vulnerabilities. In addition, current instruments at the national level need to be aligned with local priorities. At the very least, there should be coordination between various levels of governance to ensure that national-level policy is designed in ways that does not curtail or limit local experimentation by multiple actors.

Nature-based solutions must be part of inclusive planning processes for sustainable urban futures: Nature-inspired approaches to urban planning, urban governance and urban design are revolutionizing current thinking about cities and urban services. To achieve sustainable urban futures, local action cannot overlook this trend. Nature-based solutions offer the opportunity to develop a wide range of responses to urban environmental

challenges that harness nature for urban sustainability. Many of these responses can be integrated into urban planning and are often low-cost.

Future-oriented thinking, such as scenario analysis, requires plural politics that ensure diverse voices are heard to minimize uncertainties in the pathways to securing greener urban futures: Building net zero scenarios can be challenging as it involves long time frames and detailed speculation on technological and social changes, with inferences across different sectors and processes. Ensuring that diverse voices are heard in such scenario-building approaches will minimize the perception of such scenarios as technocratic and limiting stakeholders' agency as well as eliminate simplified assumptions about social and political dynamics.

Various levels of government and institutions can harness the potential of international partnerships such as transnational networks and social movements in delivering greener urban futures: Social movements, for instance, are the new point of hope for climate and biodiversity action as new generations (supported by old ones) clarify that business as usual is not an option. Social movements can foster innovation and transitions towards net zero. There is increasing evidence of innovation and feasible responses coming from informal settlements and various community groups. The COVID-19 pandemic, in particular, has shown how local responses can support solidarity and resilience, primarily when invested in partnerships with local and regional governments.

Support diverse forms of knowledge in environmental decision-making to achieve sustainable urban futures: Today, hierarchies of knowledge persist, in which some forms of knowing are consistently valued above others. Local governments and local institutions can support diverse forms of knowledge—including indigenous knowledge, local knowledge and traditional knowledge—that respond to global demands and acknowledge specificity. This also requires redefining vulnerable groups from passive victims as active urban change agents (following the slogan "nothing for us, without us").

Chapter 6

Urban Planning for the Future of Cities

Cities are complex systems that grow, develop and even shrink based on a variety of forces. Planning is an essential tool for shaping the future of cities, as unplanned human settlements are prone to sprawl, inefficient land use, poor connectivity and a lack of adequate municipal services. Good urban planning is one of the three pillars of sustainable cities, without which cities are unlikely to achieve the optimistic scenario of urban futures.

Key Findings

Recovery to pre-COVID normal is likely to delay climate action in cities: While in many cities, emissions plunged to unprecedentedly low levels during the lockdowns, rapid recovery to pre-COVID levels was observed after easing mobility restrictions with an observed increase in car dependency. There are concerns that economic recovery actions could derail many activities aimed at urban climate change adaptation and mitigation. Interventions in the energy and transport sectors are key to the success or failure of climate action in cities.

Current planning approaches continue to enable vulnerable groups to be disproportionately affected by pandemics: Vulnerable groups such as ethnic minorities and the urban poor have been disproportionately affected by the worst impacts of the pandemic, making it difficult to contain the spread of infectious diseases in cities. Modern urban planning has achieved limited success in equitably distributing resources. Profound inequalities have existed in cities for several decades, persist in the present and will possibly continue into the future without urgent changes in the way cities are planned.

Urban indoor and outdoor spaces are not versatile and flexible enough: The pandemic revealed issues related to the lack of versatility and flexibility in the design of indoor and outdoor spaces. It increased the demand for multi-purpose and flexible spaces that can adapt to new situations, which is a significant shift from traditional urban planning practices like single-use zoning that often overlook flexibility and adaptability. Moving forward, there is a need for changes in the design of urban building layouts, working spaces, shopping malls, and open/public spaces to make them more flexible and adaptive to future shocks.

Compact cities are pandemic resilient: Concerns over density being a risk factor to the rise of pandemics has resulted in outmigration in some cities and could lead to new waves of suburbanization and urban sprawl with major socioeconomic and environmental implications. No compelling evidence has been reported on the role of density in virus transmission and mortality rates. However, there is consensus that density alone is not a major risk factor, and other factors such as income, infrastructure access and residential overcrowding could be more influential. A lack of access to health care and other services will increase vulnerability to pandemics and other future adverse events.

Urban-rural interlinkages are overlooked in urban planning and decision-making practices: Urban planning approaches continue to place limited emphasis on urban-rural linkages despite cities being dependent on their hinterlands for natural resources, commodities and multiple types of ecosystem services. Urban areas experience dynamic and non-linear flows both in and out of cities whether goods, trade, human movement or species migration. Such high connectivity levels have implications for resilience as shocks and disruptions in one part of the system could rapidly spread to the other parts.

Key Messages

Urban planning should urgently pursue climate action as a basis for greener urban futures: Measures taken to recover from the pandemic should help cities mitigate and better respond to climate change, which is a major threat looming over cities. There is need for a continued paradigm shift toward environmentally friendly and human-centric energy and mobility options. This can be achieved through efficient public transport and active mobility when integrated with energy-efficient modes such as electric vehicles powered by clean energy.

Post-COVID recovery should ensure a transition to more equitable and inclusive urban futures for all: Recovery programmes should prioritize addressing the needs of vulnerable and marginalized groups, including ethnic minorities, urban poor, immigrants, refugees, and those who are precariously employed or housed. To seize the pandemic as an opportunity to reform our cities and build back batter, it is essential to carefully assess the impacts on marginalized groups and ensure they are adequately engaged in planning processes.

City authorities should invest in the multiple co-benefits of green infrastructure development: Integrating green infrastructure into the design of streets, street networks and open spaces is an effective way to enhance their flexibility and multi-functionality. Indeed, creating networks of green areas and green spaces will allow better responses to future pandemics while also providing co-benefits for climate change mitigation, adaptation and health by restoring and regenerating natural ecosystems.

Embrace the "15-minute city" concept as a model for creating walkable, mixed-use and compact neighbourhoods: As a new planning approach, the "15-minute city" can guide the development of neighbourhoods where residents can meet most of their daily needs within a 15-minute travel time on foot, cycle, micro-mobility or public transport. Through the integration of green infrastructure, this model can also provide multiple co-benefits for health, equity, and climate change adaptation and mitigation. It is, however, necessary to make sure that 15-minute neighbourhoods do not exacerbate spatial inequalities in cities by becoming enclaves for wealthy urbanites that fail to integrate into the overall urban structure.

Urban actors must break down silos in pursuit of integrated urban and territorial planning: Planning should move away from silo-based approaches toward integrated plans and policies that consider interactions between multiple factors in a city region such as the hinterlands and surrounding ecosystems. Such socio-ecological approaches are more sustainable and resilient against present and future adverse events.

Chapter 7

Public Health and Sustainable Urban Futures

As history attests, the productivity and resilience of cities is undergirded by effective public health. Beyond hospitals, medicines and vaccines, equitable provision of health-promoting infrastructure such as green spaces, improved housing, clean and safe drinking water, and extensive sewer systems to safely dispose of human waste are necessary minimum components for securing public health in urban areas. While COVID-19 led to the first major global pandemic in a century, the future portends more epidemics and pandemics. Public health is now once again at the forefront in envisioning the future of cities.

Key Findings

Urban health risks are multi-layered and change rapidly: Since 2020, cities have had to grapple with more than just COVID-19 as Ebola, bird flu, H1N1 flu, MERS, SARS and Zika outbreaks occurred at different times and in different cities. The HIV-AIDS epidemic continues to be of concern with elevated rates of infection amongst marginalized groups such as racial/ethnic minorities, migrants and intravenous drug users. Moreover, climate-related risks are now increasingly contributing to urban deaths and ill health. Annually, an estimated 7 million people die prematurely due to air pollution. Urban food system transformations towards ultra-processed foods with high levels of fat and sugar have led to the progressive increase of diet-related health risks and the rising toll of non-communicable diseases in both low-income and higher-income cities.

In many urban areas, the same health risks are experienced and acted upon in different ways: These differences are attributed to racial divides, gendered discrimination, xenophobia and other sources of disadvantage. If left unchecked, these health inequities could lead to the pessimistic or even high damage urban future scenario. An improved understanding of how multiple factors contribute to urban health disparities at several levels and sites (including homes, workplaces and neighbourhoods) is key to effective interventions that can avoid entrenching urban health inequities.

Climate change is the foremost urban health threat and risks leading to the high damage urban future scenario: Climate change manifests in more frequent, intense and longer-lasting extreme weather events, particularly floods and heatwaves. These and other disasters translate to complex overlapping urban health burdens, starting with immediate injuries, mortality, displacement and lost livelihoods amongst affected residents. Broader impacts include rising levels of urban water insecurity, increased rates of waterborne illness and escalating food prices and food insecurity. Unabated, these conditions create a fertile ground for the high damage urban future scenario where health vulnerabilities are amplified, and poverty and inequality persist over the long term.

The increase in mental related illnesses is a growing urban health concern: Mental disorders are in the top 10 leading causes of disease burdens globally, and the number of disability-adjusted life years (DALYs) lost due to mental illness has increased by over 55 per cent over the last two decades. Rising levels of depression, anxiety and other mental health impacts have been linked to COVID-19, particularly for essential workers, those with heightened caring duties (especially women), racial/ethnic minorities and other vulnerable groups.

The shift in armed conflicts to urban battlegrounds is another growing concern that could lead to the high damage scenario for urban futures: The use of heavy weaponry in towns and cities inevitably leads to heavier civilian casualties and destruction of interconnected basic infrastructure such as water, sanitation, gas and electricity lines leaving fragile communities highly susceptible to infectious diseases. Further, armed conflicts disrupt health systems including physical destruction of hospitals, flight of healthcare workers and interruption of child vaccination and communicable disease surveillance programmes. These health systems require intense time and resource investments to rebuild. Consequently, the occurrence of armed conflict can lead to prolonged instabilities and intractable poverty as resources are diverted away from development long after the weapons are silenced.

Key Messages

If cities take the Health in All Policies Approach, they can make progress on multiple SDGs: By mainstreaming the Health in All Policies (HiAP) approach, cities can realize multiple benefits and unlock synergies between health and sustainable development pathways. Adding a health perspective in urban decision-making can simultaneously improve health (SDG 3), tackle poverty (SDG 1), foster gender equality (SDG 5) and enhance access to clean energy and climate-resilient infrastructure (SDGs 7 and 9).

Local governments are best placed to design and implement multisectoral approaches to effectively realize healthy urban futures: A multisectoral approach is necessary because health is an essential component of sustainable urbanization given its impact on and interrelation with social, economic and environmental targets. Responsive, accountable local governments play a pivotal role in translating global and national targets to effective place-based interventions that generate multiple co-benefits for health, inclusion and climate change mitigation. Local governments, however, need stable funding, long-term political support and effective mechanisms for public engagement.

Ongoing disaggregated data collection is essential for effective responses to future urban health risks: Since urban health risks are multilayered and change rapidly, policymakers require ongoing data collection with attention to emerging and differentiated health challenges in urban areas. Using disaggregated data to inform inclusive interventions, policymakers can develop holistic multisectoral initiatives that address complex urban health inequities and support locally rooted solutions. City authorities can leverage digital technology such as telemedicine and drones, as well as community-led citizen science, to collect data from marginalized and hard-to-reach groups to ensure they leave no one behind.

Governments should provide universal health coverage to strengthen future health system preparedness: With the anticipation of future epidemics and pandemics, inequitable access to quality healthcare compromises the collective health and well-being for all. COVID-19 has unequivocally demonstrated that in an interconnected world, infectious diseases mock geographic, socioeconomic and other privilege boundaries. As part of the new social contract, governments should provide universal health coverage that secures equitable access as well as sufficient quality and affordability of healthcare for effective response to urban health crises in the future.

Addressing mental illness is an urgent priority not only for supporting health and dignity but also for continued economic and social development: Improving access to mental health programmes and developing holistic strategies to address mental illness remain a key concern globally, especially in the wake of COVID-19. Key priorities for equitable, inclusive mental health initiatives include additional investments that link mental health with universal health coverage and primary healthcare interventions. The new approach to mental health must move beyond biomedical techniques and instead seek to address the social determinants of health such as improving access to urban green spaces and enhancing social cohesion, as well as countering stigma facing those with mental illness.

Chapter 8

Rethinking Urban Governance for the Future of Cities

Whichever future urban challenge cities face, whether it is poverty, health, housing or the environment, urban governance always has a critical enabling role to ensure that the capacities and resources of institutions and people match their responsibilities and desires. Sustainable urban development is not possible without effective multilevel urban governance – including local governments, civil society and national governments. Governments have been severely tested since 2020, which means now is the time to rethink urban governance and put cities on the path to an optimistic future scenario.

Key Findings

A spatial justice approach is essential to respond to shocks: A spatial justice approach that includes vulnerable residents in decision-making has proven to be essential in responding to future global shocks. Cities with a more equitable and accessible distribution of basic services were better able to protect vulnerable and high-risk communities from the COVID-19 pandemic. Cities with more autonomy in local government are better positioned to respond to health care crisis with contextualized knowledge and experiment with different approaches and service delivery.

COVID-19 accelerated the digitalization of urban governance: Physical distancing and lockdowns required governments to rapidly scale up their use of digital technology to conduct basic functions. This trend provides opportunities for the future of urban governance as governments can use new technologies to make data collection more reliable, provide more open data, communicate better with residents and improve service delivery. But cities also have a responsibility to govern how new technologies are used and work to eliminate the digital divide while protecting the safety and privacy of residents.

City diplomacy and international city networks are increasing in number and political potency: Cities and subnational governments are reasserting themselves on the international stage and supplementing national governments where national frameworks are lacking. City diplomacy and international city networks provide an emerging opportunity for cities of all sizes and geographies to address transnational issues, as well as exchange experience and learn from each other to adapt governance approaches to evolving future challenges.

A lack of human and financial capacity continues to strain sustainable urbanization: Cities, especially in developing countries, continue to lack adequate capacity to address current and future challenges. A lack of resources and trained professionals limits the capacity needed to implement transformative changes, while also creating conditions for corruption. The future of multilevel governance relies on effective decentralization of decision-making, enhancing local fiscal autonomy and stronger links between national urban policies and cities.

Civil society and participatory process are under threat: While many cities are engaging in innovative participatory processes, globally, the space for civil society is shrinking. State-initiated participation can be tokenistic and is often disregarded in crisis situations. Evidence of, or even the perception of corruption, or mishandling of finances undermines trust between the government and civil society. If this trend continues, the future of cities will be more authoritarian.

Key Messages

Future urban governance should institutionalize the mindset of planning for shocks and disruptions: For urban governance to be prepared for an age of global threats and disruptions it will require collaborative and concerted action to prepare processes and systems that can withstand and recover from shocks in an effective and inclusive way. There is a need to institutionalize planning frameworks that incorporate disruptions as a central element and learn from previous shocks and challenges. Effective multilevel governance for disruptions needs to balance clear legal frameworks with a flexible approach to new partnerships, cooperation, solidarity and collective action within and between state and non-state actors.

The need to build trust and legitimacy of institutions is crucial for the future of urban governance: With the anticipated rise in global shocks including climate, security and public health crises, the need for trust and legitimacy of institutions is crucial. With ever larger cities, the distance between governments and their citizens has increased. Effective communication, meaningful participation opportunities and accountability structures built into integrated governance relationships are all necessary

responses for addressing the trust equation. In light of the digitalization of urban governance, maintaining privacy and security of data should be a priority for maintaining trust.

The future of effective local government relies on well-coordinated metropolitan governance: Future urban areas are projected to grow far beyond the boundaries of any particular jurisdiction, which necessitates new and adaptable urban governance and management frameworks. Metropolitan governance with institutionalized frameworks has demonstrated an ability to optimize coordination, engage secondary and rural communities, and create collaborative approaches in mitigation, adaptation and recovery efforts. The future of metropolitan governance, however, is plural: there is no single metropolitan model of governance that works everywhere. Metropolitan governance needs to have adequate political and institutional legitimacy, clearly defined roles and need capacity and resources that meet their responsibilities.

National governments should enable better local government finances to respond to the challenges of urbanization: Effective models for collaborative governance, financing and integrated development should be responsive to ever-changing future conditions and needs. Financial managers should resist parachuting normative best practices into inappropriate contexts. Sustainable urban development requires comprehensive and context specific financial management that includes diverse sources of funding. Clearer national regulation and more decentralized governance plays an important enabling role to a financially solvent urban future, making transfers to local governments more regular and allowing cities to borrow and issues bonds.

The future of equitable service delivery relies on governance through modes of co-production with relevant stakeholders: Achieving equitable outcomes with respect for human rights and the well-being of residents will require urban policymakers to re-envision their relationship with the public. Governments need to fully acknowledge and invest in slum dwellers and their organizations as true development partners. Special attention must be paid to underrepresented groups and co-create strategies such as re-municipalization, community-led finance and forms of co-production of urban services. Civil society has different roles—as service providers, agents for civic engagement and enforcers of social accountability, and as financiers through philanthropy—and the future of urban governance needs to ensure regulation better reflects the different roles they play in society.

Chapter 9

Innovation and Technology: Towards Knowledge-Based Urban Futures

Advances in technology and urban futures are inextricably linked. The future of cities will be knowledge-based, driven largely by innovation and the widespread use of new technologies and digitization of virtually all facets of urban life. Technological innovations define the twenty-first century. Cities are going through a wave of digitalization that is reshaping how urban dwellers live, work, learn and play. Technology holds great promise for improving urban livelihoods, but there are also risks that smart city technology will invade privacy. Cities, meanwhile, are competing for innovation-based businesses in a race that will create both winners and losers in urban futures.

Key Findings

Innovation and technology play an increasingly central role in planning for urban futures: This arises from rapid advances in technological developments, the pace of urbanization, and the scale of urban challenges requiring systemic responses. Urban innovation extends beyond technology: it also encompasses social and organizational innovation, which recognizes the important contribution of civic organizations and community groups to urban development, and the benefits of more open and collaborative local government.

Digitalization and automation are transforming urban economies: Smaller cities and suburban areas may benefit from the shift towards hybrid working (accelerated by the COVID-19 pandemic). Larger cities may be less exposed to the impacts of automation, given the concentration of highly skilled professionals. Significant changes in the mix of job occupancies can be expected in the formal economy in both developed and developing countries. Some cities offer re-skilling programmes to prepare residents for the future of work. In informal economies, digitalization may provide significant opportunities.

The urgency to decarbonize urban economies is driving the convergence of green and smart technologies: A key feature of smart environmental technologies is their suitability for flexible, modular designs and local adaptations. The benefits include sustainable energy production, improved resilience and financial incentives (e.g. feed-in tariff) for

residents. The trend towards more localized applications highlights the importance of on-the-ground partnerships and community buy-in.

There is a rapid growth in the demand for smart city technology: The demand for smart city systems and solutions is estimated to increase annually by 25 per cent, with an overall market value of approximately US$517 billion. This is driven by governments investing in technology to meet the demands of an urbanizing world. This also based on rapid advancements in digital and connected technologies and their ubiquity in everyday life. The speed with which cities are adopting smart technology is illustrated by strong demand for Internet of Things technology, with over 20 per cent annual growth forecast for the coming years. Similarly, blockchain technology is predicted to grow by over 30 per cent in the next few years. Artificial Intelligence technologies are increasingly deployed by municipal governments in the form of virtual agents like chatbots.

Technological advances risk exacerbating existing, and generating new, socioeconomic inequalities: The digital divide tends to adversely affect women, the elderly, ethnic minorities and immigrants most acutely. Cities can mitigate this with measures include providing affordable Internet access, skills training and community support. An environmental divide occurs when urban sustainability initiatives disproportionally benefit middle-class residents. Cities are faced with a series of complex ethical, legal, and technical issues through the introduction of frontier technologies, such as drones and autonomous vehicles. This requires careful assessment. Several initiatives have been put in place to mitigate the risks of digitalization and other technological innovations.

Key Messages

Innovation practices need to be tailored to local contexts: Smaller cities, and cities in emerging and developing countries, may need alternative approaches to innovation than those pursued by world cities and major metropolitan regions. Cities can use their convening power to nurture a culture of innovation with a focus on addressing major urban challenges. Innovation should be approached more broadly than traditional research and development by involving a wider range of stakeholders, including civil society organizations and community groups. City governments can lead by example, by innovating in more open, collaborative, and inclusive planning and decision-making.

City governments should embrace low-carbon technology but mitigate negative environmental effects: The combination of green and smart technologies creates new opportunities for small-scale and small-grid, modular, and flexible systems and applications. Together with their relative affordability, this can benefit communities, towns and cities with limited financial and infrastructural resources. But cities need to consider the negative environmental externalities when investing in low carbon and digital and connected technologies. This includes environmental problems associated with the mining of rare earths (e.g. lithium for batteries), toxic electronic waste and high energy consumption of some technologies (e.g. blockchain).

Local governments need to prepare their economies for the effects of advancing automation and digitalization: This includes taking an active approach to digital (labour) platforms, if necessary, with appropriate regulation to address the problem of precarious work. There is an important agenda for skills development and training, to counter the risk of growing social inequalities and exclusion arising from technological advances. This should particularly focus on those on the wrong side of digital and environmental divides. Mobilizing community members as trainers can be useful, for example in informal settlements.

Cities can use digital tools innovatively to improve the provision of public services and local decision-making: To avoid top-down, one-way communication, digital tools need to be inclusive, collaborative and empowering. Their use needs to align with wider offline decision-making structures and processes. While full technological sovereignty may be out of reach, city governments have an opportunity and responsibility to co-determine how innovation and technology are designed for, and applied in, cities. They should initiate, and participate in, technology assessments, and involve other urban stakeholders in the process.

Chapter 10

Building Resilience for Sustainable Urban Futures

Any scenario of urban futures outlined in this Report will face unexpected shocks and stresses. Will a given city collapse like a house of cards or withstand whatever unpredictable future comes their way? The answer to that question lies in a city's resilience, a capacity that bookends all of the discussion up to this point. A key message running through this Report is that building economic, social and environmental resilience, including appropriate governance and institutional structures must be at the heart of the future of cities. Cities that are well-planned, managed, and financed have a strong foundation to prepare for such unknown future threats. Moreover, cities that are socially inclusive and work for all their residents are also better positioned to face environmental, public health, economic, social and any other variety of shock or stress, as cities are only as strong as their weakest link.

Key Findings

Resilience thinking has embraced the "building back differently" mentality: The schools of thought on urban resilience continue to evolve and now emphasize the importance of positive change in recovery processes to reduce urban poverty and inequality as key determinants of vulnerability and risk exposure. This means addressing the spatial and environmental as well as social inequality and injustice that are reflected in the urban built environment.

Resilience practitioners can benefit from several diagnostic, monitoring and evaluation frameworks: The most widely used of these tools is the City Resilience Index. These frameworks examine the economic, social, environmental and institutional dimensions of resilience. However, addressing these dimensions separately risks negative trade-offs. Maximizing added value and prospects for success therefor requires integrated and holistic policy and practice, as emphasized through the analysis of good governance and integrated, holistic policy and planning.

There is no either/or dividing line between incremental and transformational change in human settlements: If the current context has clearly prevented a step-change to transformational adaptation, it is unlikely suddenly to become feasible and be initiated without substantive reform or realignment of governance institutions and processes. Moreover, such changes are often complex, messy and slow. Conversely, substantive gains can be made under broadly existing arrangements, promoted by appropriate champions among officials and elected representatives, and that do not demand unrealistic institutional reinventions as a prerequisite.

Science and technology are evolving rapidly and opening new possibilities for positive change: However, the equity and justice dimensions to such technological deployments are often overlooked. Who benefits and who suffers when constraints are introduced? The costs and benefits of specific technologies or an entire technology-driven package like smart cities, when introduced into particular contexts, need explicit inclusion in planning, decision-making and monitoring.

Effective urban resilience capacity building requires mainstreaming across local government: Proactive climate change, vulnerability and disaster risk reduction and pandemic response policies cannot be undertaken as add-ons to other work or concentrated in one specific department, but rather must be incorporated into the annual and multi-year workplans and design standards of all departments. In turn, this requires effective forward-looking design and planning frameworks that factor in local forecasts of future climatic, environmental and public health conditions so that infrastructure, buildings and services are built or retrofitted to appropriate standards to withstand best estimates of conditions that will prevail over the coming decades.

Key Messages

Governments already have a roadmap to urban resilience in the global sustainable development agenda: The multilateral system has laid out a framework for achieving urban resilience in the form of the SDGs, the New Urban Agenda, Sendai Framework for Disaster Risk Reduction, the Addis Ababa Action Agenda and the Paris Agreement on Climate Change. Together these documents provide a coherent framework for integrated, multi-level action that recognizes the importance of subnational entities, particularly local governments, in building resilience.

Building substantive urban resilience must be multisectoral, multidimensional and multi-stakeholder: The process of making cities more resilient only works if it is forward-looking, inclusive of all stakeholders (including

the marginalized and poor) and proactive. It also provides an integrated investment in preparedness and building back differently, not just building back, or building back better along the same lines that perpetuate existing inequalities and injustice. Hence, as with sustainability, resilience is about increasing equity while reducing poverty and injustice.

Policymakers must match urban risk assessments with appropriate solutions: Cities face a diverse range of hazards, including but not limited to pandemics and climate change, and must create accurate, localized and downscaled assessments of those threats. But without appropriate remedial steps, cities risk leaving their citizens despondent. Furthermore, short-term plans and interventions, such as those within a single planning, budget or electoral cycle, must align with those for the medium and longer terms, which are the relevant time horizons for addressing structural inequalities and so-called "wicked" challenges like building sustainability and resilience.

Visioning and implementation of urban resilience plans must prioritize the poorest and most vulnerable communities: These categories of urban residents face the brunt of hazards and risks due to their location, as frequently they are confined to less desirable and more risky urban land. Such populations are disproportionately experiencing cascades or chains of increasingly frequent and often severe impacts that are compounding their vulnerability by undermining their assets and resilience.

Building urban resilience will not succeed without public participation: Resilience is not a top-down process but rather a bottom-up one, and any effort to prepare resilience plans, draft policies or implement projects will have greater prospects for success if undertaken using active participatory methods so that all residents and stakeholders are involved in planning and decision-making. Through co-production and co-design of resilience, residents will develop a shared sense of ownership alongside local government.

Chapter 1:

The Diversity of Cities and Visions for Urban Futures

Quick facts

1. Cities are here to stay, and the future of humanity is undoubtedly urban, but not exclusively in large metropolitan areas.

2. Urbanization will continue to be a transformative, but uneven process that will require differentiated responses depending on the diversity of the urban context.

3. The worst-case scenario of urban futures will have disastrous consequences for cities; thus, resulting in economic uncertainties, environmental challenges and exacerbate existing vulnerabilities.

4. A business-as-usual approach will result in a pessimistic scenario of urban futures characterized by the systemic discrimination and exclusion of the poor in urban agendas.

5. With concerted policy action, it is possible for cities to avoid either of the high damage or pessimistic scenarios and instead emerge into a more optimistic urban future.

Policy points

1. The emergence of urbanization as a global mega-trend is intertwined with the existential challenges that the world has faced in the last 50 years.

2. Building economic, social and environmental resilience, including appropriate governance and institutional structures, must be at the heart of the future of cities.

3. The disruptive nature of COVID-19 and the emerging global uncertainties are all stark reminders that urban areas need to be prepared for an ever-changing and unpredictable future.

4. Any vision for an optimistic future of cities must embody a new social contract with universal basic income, health coverage and housing.

5. Localizing the New Urban Agenda and SDG 11 is the most promising pathway to the optimistic scenario of urban futures.

1.1 What Futures for Cities?

Policymakers, researchers and urban residents have long been preoccupied with the future of cities, particularly in charting the divergent demographic, economic, social, environmental and policy pathways that will lead towards more sustainable outcomes.[1] This preoccupation is due to a greater recognition in the multilateral system of the role that urban areas play in securing sustainable futures across a range of key global issues, including climate change, inclusive economic growth, poverty eradication, housing, infrastructure, basic services, productive employment, food security and public health.[2] Analysis of a range of urban futures offers an investigative and diagnostic view on how cities can be prepared for an ever-changing world. Such analysis can also explore the drivers and scenarios behind the aforementioned pressing global challenges, all of which have an increasingly urban dimension.

Recently, the future of cities agenda has assumed a greater level of importance and urgency given the disruptive impacts of COVID-19 and its implications for urban areas.[3] In this regard, governments, international agencies, the private sector and scholars, among others, are critically examining what the future of cities portends in the aftermath of COVID-19.[4] While the early days of the pandemic in 2020 created a temporary crisis of confidence in the urban future as many of the world's largest cities saw their populations shrink and their residents disappear from public spaces, a broad consensus is that urbanization remains a powerful twenty-first century mega-trend. Indeed, there is now an emerging sense of optimism that the crisis may provide us with the opportunity to build back better, stronger, more inclusively, greener and safer based on the impacts and lessons learned from the pandemic. COVID-19 provides the opportunity to look back, correct past mistakes and transform cities globally for future resilience, inclusion, green growth and economic sustainability.[5]

In casting an eye on the future, we must also establish crucial links with the past. That imperative compels us to embrace the overarching role of multilateralism, especially the interrelationship between the various development agendas adopted in the last decade, in the quest to find long-term solutions to global challenges such as the ongoing pandemic, climate change, inequality and rising poverty. Since 2020, armed conflict has also taken centre stage among pressing challenges that impede sustainable urban development. Years old conflict has persisted in Syria and Yemen, while new conflicts have flared up in Ethiopia, Myanmar and Ukraine. The seizure of power in Afghanistan by the Taliban in 2021 was also tumultuous for human settlements across the urban-rural continuum. These conflicts are reminders that the spectre of war remains an enduring threat even in the twenty-first century. Ultimately, however, the lessons from the pandemic offer an opportunity to reflect on the role of local governments in driving the direction of city diplomacy amid global systemic disruptions.[6] The world must maintain its focus on delivering the global development agendas and local governments are key players at the forefront of that effort. Local governments have not only embraced these agendas, but they were actively involved in their negotiation.[7]

The future of cities agenda has assumed a greater level of importance and urgency given the disruptive impacts of COVID-19 and its implications for urban areas

Since 2020, armed conflict has also taken centre stage among pressing challenges that impede sustainable urban development

The emerging "new normal" seeks to brings us closer to the solutions and behavioural changes that address the structural problems of the past and set us on the path to a more sustainable future. For instance, the short-term environmental gains that accompanied the lockdown during the peak of the pandemic in 2020 are an indication of the willingness of people to comply with government directives and alter their behaviour for the common good. Urban areas are best placed to foster the behavioural and lifestyle changes that are necessary to ensure the transition to resilient and sustainable urban futures. Cities remain central to the sustainable development trajectory as planned urbanization provides the foundation, institutions and prosperity that are crucial in the efforts to build back better, more inclusively, greener, safer and smarter.

Most cities are not able to meet the triple objective of being economically productive, socially inclusive and environmentally sustainable.[8] Consequently, transformation in cities and communities along certain priority areas are required to achieve the Sustainable Development Goals (SDGs). These priorities include ensuring access to a clean water supply, functional sanitation, and appropriate sewage and waste disposal; providing sustainable and efficient

mobility; promoting more compact, safe and healthy settlements; and enhancing resilience against climate change, extreme weather events and disease transmission.[9] All of these priorities resonate with measures taken to mitigate the impacts of COVID-19 and achieve more sustainable urban futures.

The United Nations gave us a glimpse into the future in 2014 when it collated 202 contributions from scientists in response to the question "What do you think the world will be like in 2050?" These responses were synthesized to 95 ideas and the scientists were invited to vote on their ideas. Table 1.1 shows the top 15 ideas that were voted as the likely futures if the world continues in the business-as-usual historical path of incremental improvements in reaction to perceived crises, instead of a shift towards a long-term perspective anticipating the troubles ahead.[10] The standout ideas are accelerating climate change, inequality, poverty and unsustainable consumption of natural resources. Many of these issues are unfolding in urban areas (as indicated in the shaded areas of Table. 1.1), which account for 56 per cent of the world's population. In just six years, many of these anticipated future outcomes have been accelerated by the impacts of the COVID-19 pandemic.

From a demographic perspective, a glimpse into the future, points to a world that will continue to urbanize over the next three decades – from 56 per cent in 2021 to 68 per cent in 2050, with urban areas absorbing virtually all the future growth of the world's population (Figure 1.1).[11] Whatever urban-to-rural migration occurred temporarily during the COVID-19 pandemic is not forecasted to alter the fundamental reality of a predominantly urban world. This trend line implies that the level of urbanization will increase by 12 percentage points over the next three decades, which translates to an increase of 2.2 billion urban residents, with most of these living in Africa and Asia. All regions of the world are expected to become more urbanized in the next 30 years, although highly urbanized and more developed regions are expected to stabilize or experience a decline in the rate of urban growth. Unequivocally, this tells us that cities are here to stay, and that the future of humanity is undoubtedly urban, but not exclusively in large metropolitan areas (Chapter 2).

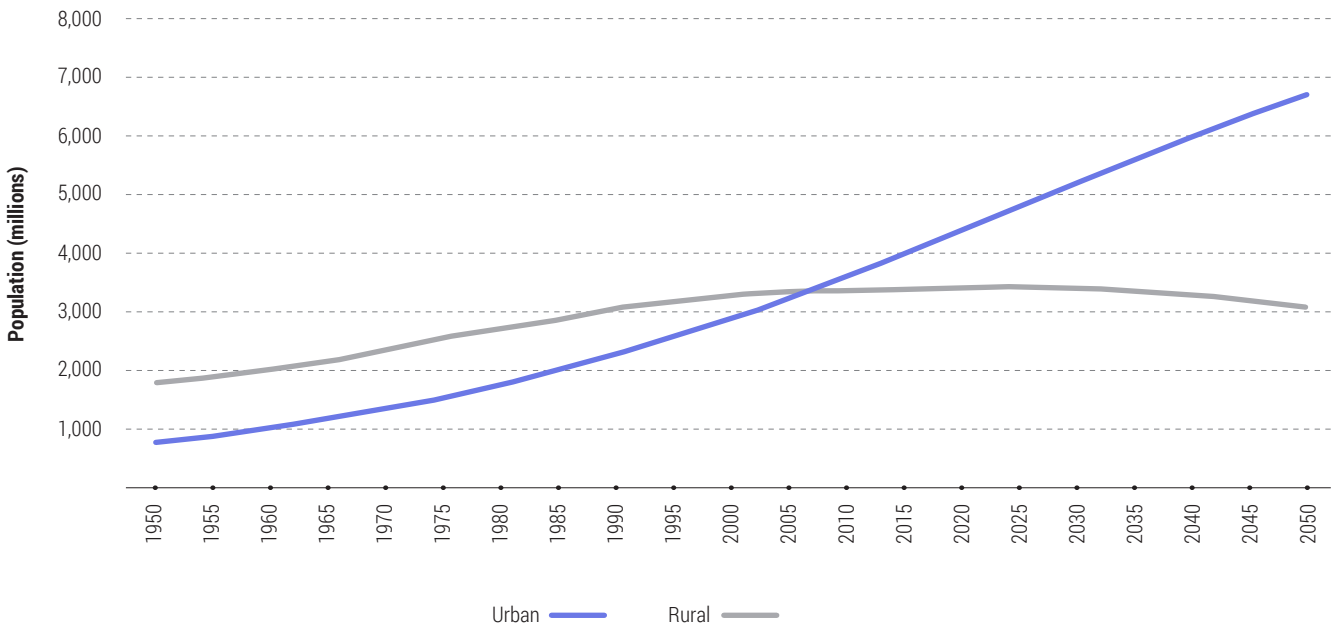
The increase in urbanization is intertwined with the existential challenges that the world has faced in the last 50 years.[12] These challenges include long-term stresses like climate change and income inequality, as well as immediate

Table 1.1: Top 15 crowdsourced answers to the question "What do you think the world will be like in 2050?"

Idea	Score
Global collapse of ocean fisheries before 2050	90
Accelerating climate change	89
There will be increasing inequity, tension and social strife	86
Global society will create a better life for most, but not all, primarily through continued economic growth	86
Persistent poverty and hunger amid riches	86
Humanity will avoid "collapse induced by nature" and has rather embarked on a path of "managed decline"	83
Two-thirds of world population will be under water stress	83
Urbanization will reach 70 per cent (+2.8 billion people in urban areas, -0.6 billion in rural areas)	83
The number of people going hungry will be reduced by 500 million people, still leaving 250 million with insufficient food	83
Continued lack of understanding of the complex non-linear dynamics of ecosystems	80
Food production peaks around 2040 at a level 60 per cent above today's current levels, in terms of tonnes of food per year	75
Gross world product keeps growing until the second half of the twenty-first century, but at an ever-decreasing rate	75
Temperatures and sea levels will continue rising, as will the share of renewable energy use	75
Massive human interference with phosphorus and nitrogen cycles well beyond safe thresholds	75
Greenhouse gas (GHG) emissions will increase by 70 per cent, from 48 to 83 GtCO2-equivalent. Most of the increase will be in Brazil, Russia, India, China and South Africa (BRICS).	75

Source: UNDESA, 2014a.

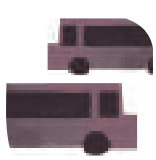
Figure 1.1: Urban and rural population of the world (1950-2030)



Source: UNDESA, 2019b.

shocks. The risk of zoonotic viruses came to the forefront with the COVID-19 pandemic, which triggered the worst public health crisis in a century and the worst economic recession since the Great Depression. The armed conflict in Ukraine that began in February 2022 has led to the most destructive urban warfare since World War II. These challenges will leave their imprints on the future of cities in different ways. The concentration of greenhouse gases as measured by carbon dioxide, driven mainly by human activities, especially the burning of fossil fuels, has been increasing since 1958 and currently stands at 413.64 ppm.[13] The Intergovernmental Panel on Climate Change (IPCC) report Climate Change 2021: The Physical Science Basis notes that global warming of between 1.5°C and 2°C will be exceeded during the twenty-first century unless net carbon emissions decline by 45 per cent by 2030 based on 2010 levels.[14] This report was a call to action for sustained reduction in the use and production of fossil fuel and massive investments in clean energy projects and infrastructure to the tune of US$4 trillion annually by 2030 to get the world on track for net zero emissions by 2050.[15]

However, current plans by governments to produce fossil fuels up to 2030 are incompatible with limiting global temperatures to 1.5°C. Global energy markets have been in flux since Russian military operations in Ukraine began and the long-term consequences of that conflict remain to be seen. Many countries have signalled their intention to stop importing Russian oil and gas, but it as yet unclear if this geopolitical shift will accelerate the adoption of renewable energy or shift consumption to other sources of fossil fuels. Regardless of recent events, Chapter 5 notes that the transition to net zero is marked by lack of ambition and policy pitfalls. The assessment of recent national energy plans and projections shows that governments are in aggregate planning to produce around 110 per cent more fossil fuels in 2030 than would be consistent with limiting global warming to 1.5°C, and 45 per cent more than would be consistent with limiting warming to 2°C, on a global level.[16] By 2040, this excess is expected to grow to 190 per cent and 89 per cent respectively. While many governments have pledged to lower their emissions and even set net zero targets, they have not yet made plans to wind down the production of the fossil fuels, which generate most emissions.[17]



Current plans by governments to produce fossil fuels up to 2030 are incompatible with limiting global temperatures to 1.5°C

Growing inequality in the face of increasing global income is an indication that the gains in real income have been beneficial to the very wealthy in all countries and to the rising middle class in developing countries

We have also witnessed continuous growth in the world economy: doubling since 2000 to US$66.2 trillion in 2010 and increasing to US$84.7 trillion in 2020.[18] At the same time, inequality, which has been increasing for more than 70 per cent of the world's population,[19] is expected to rise further on account of the impacts of COVID-19. Growing inequality in the face of increasing global income is an indication that the gains in real income have been beneficial to the very wealthy in all countries and to the rising middle class in developing countries.[20] The bleak prospects for low-skilled workers and young people in the labour markets of low-income countries in the aftermath of COVID-19 point to increasing levels of inequality and higher vulnerability to extreme poverty; as between 65 and 75 million more people are estimated to fall into extreme poverty in 2021 compared to pre-pandemic projections.[21] High rates of inflation globally as well as disputed food supply chains due to the conflict in Ukraine are putting further strains on the lowest rungs of the economic ladder. We cannot envision a bright future for cities when inequality appears to be on the rise globally and extreme poverty looms in certain regions. Chapter 3 discusses what needs to be done to prevent poverty and inequality from becoming permanent features of the future of cities.

Rapid urbanization and the globalized nature of cities have added new layers of urban health risks as the world has increasingly witnessed the spread of zoonotic diseases such as avian influenza, severe acute respiratory syndrome (SARS), Ebola and most recently, COVID-19. As cities seek to recover from the impacts of the pandemic, the UN-Habitat report Cities and Pandemics: Towards a More Just, Green and Healthy Future makes a case for a new social contract in the form of universal basic income, universal health coverage and universal housing.[22] This proposal is further discussed in this chapter and in Chapter 3.

Demographic responses to COVID-19 indicate a new pattern of secondary cities as subregional hubs that connect the 62 per cent of the world's population living in smaller cities, towns and rural areas with the 22 per cent that live in larger metropolitan regions.[23] Following the outbreak of the COVID-19 pandemic, many urban dwellers, especially those in large cities, fled. More affluent residents retreated to second homes in the countryside. Middle-class families moved to smaller towns that offered more affordable housing. Low-income residents saw service sector jobs decimated and left in search of economic opportunity. The cumulative effect was a net decline in major cities. For example, United States Census data shows the largest net declines in population from 2020 to 2021 were in Los Angeles County (179,757) and Manhattan (113,642).[24] Although such net population declines might be temporary, this reshuffle has implications for the role secondary cities can play in the future as more workers in knowledge-based fields work remotely or adopt hybrid modes of working.

This territorial reorganization raises the question of what will happen with small- and medium-size cities as they become increasingly important in the regional landscape? Will accelerated digitalization prompted by the COVID-19 pandemic undo the economic advantages of large cities?[25] On the contrary, can economies of scale and agglomeration effects show their capacity to re-energize new urban activities in the aftermath of shocks and threats?

These concerns raise key questions about the future of cities, especially the kind of cities needed to support humanity in a predominantly urban world. How do we envisage and reimagine the future of cities? What do we want our cities to look like? What are their different possible transitions and trajectories? What are the possible scenarios for growth and development? What are the most desirable outcomes and the likelihood of achieving them?

1.2 Pandemic Lessons for the Future of Cities

The disruptive nature of the COVID-19 pandemic is a stark reminder that urban areas need to be prepared for dynamic and unpredictable futures. The pandemic clearly exposed the soft underbelly of cities and their vulnerability to shocks. Cities across the world were totally unprepared for the magnitude of the economic and social impacts of the pandemic. We live in an age of global threats and disruptions that require concerted action, which can only be achieved in the spirit of solidarity and cooperation, as no single government or multilateral agency can address such threats alone.[26] The world must therefore be better prepared to predict, prevent, detect, assess and effectively respond to threats in a highly coordinated manner.[27]

Subway train passengers with protective masks, Sofia, Bulgaria © Shutterstock

Box 1.1: Five lessons from the COVD-19 pandemic

Reflecting on the nature of and responses to the COVID-19 pandemic helps us filter some key lessons for the urban world, which is likely to witness other epidemics and even pandemics in years to come. As such, cities must be prepared for a dynamic and unpredictable future.

i. The pandemic crossed territorial boundaries despite border closures. Geographic exclusion and social privilege had limited efficacy. Highly contagious disease teaches us that a threat anywhere is a threat everywhere. Effective response to a global threat calls for multilateral collaboration that complements and reinforces national and local efforts in a spirit of solidarity, mutual respect and cooperation.

ii. The pandemic reminded us that well-planned cities can better manage contagion when they provide density without residential overcrowding, enhance accessibility, limit urban sprawl and provide room for public green spaces. Integrated urban planning that promotes socio-spatial equity and green, well-provisioned neighbourhoods for people's health and well-being is critical for adaptation and resilience for the future.

iii. No one level of government and no single ministry, department or agency was able to address the pandemic on its own. The most effective and efficient urban governance framework in the face of dynamic, unpredictable urban futures proved to be multilevel governance with multi-stakeholder collaborations from the micro level (neighbourhood) to the meso level (sectoral) to the macro level (regional to global).

iv. Effective responses defined the pandemic on a broader perspective beyond the health domain, recognizing the socioeconomic, political and built environment factors that aggravated risks and vulnerabilities. Socio-spatial inequalities manifest in the urban services divide, which presented nodes of weakness in curbing the spread of the virus. Bridging the gap and addressing multidimensional urban poverty and inequalities in access to water, sanitation, basic health, adequate housing and digital tools are crucial for building resilient urban futures.

v. The post-pandemic city is not the same as the future city. While emergency responses to the pandemic offered us a glimpse of a radical shift in daily urban life, their social and environmental benefits were short-lived. Realizing the green, inclusive, sustainable urban futures will require deliberate long-run transformative interventions closely attuned to the demands of local contexts and backed by adequate resources.

The pandemic revealed and amplified long-standing weaknesses in the social structure of cities, resulting in disproportionate impacts on specific segments of the population, especially vulnerable and marginalized groups. Key lessons emerging from the COVID-19 pandemic are that urban areas must invest in preparedness, which requires developing the economic, social, environmental and institutional resilience to respond to a wide range of shocks, including having contingency plans for the most vulnerable groups (Box 1.1).[28]

If the world were to experience another pandemic or major threat in the future, would urban areas be sufficiently prepared to respond based on the lessons learned from the COVID-19 pandemic? Would cities have developed a robust system of resilience to respond to and withstand such a threat? To meet this challenge, urban futures must reduce inequality and poverty; foster productive and inclusive urban economies that provide opportunities for all; and adopt environmental policies and actions that mitigate and adapt to climate change, promote clean energy and protect ecosystems – all of which are facilitated by responsive planning and governance systems in which with finance, innovation and technology play overarching roles.

The unpreparedness of cities to address pandemics and related shocks is an indication that the current process or model of urbanization is inadequate on several grounds. In many contexts, the outcome of this process of urbanization is environmentally, socially and economically

unsustainable.[29] Under such conditions, the process is, to some extent, dysfunctional and even erodes the inherent value of urbanization.[30] Disease modellers are quick to note that COVID-19 will not be the last pandemic that cities will face; new outbreaks of other pandemics and major health emergencies will occur[31]; cities will experience recessions, natural disasters, armed conflict and social unrest, among other shocks. As has often been repeated over the last two years: a threat anywhere is a threat everywhere and no one is safe until everyone is safe.[32]

Our urbanizing world must be adequately equipped to respond effectively to a broader range of shocks and ensure the transition to a more equitable, inclusive, green, resilient and healthy future. If not, millions of city dwellers in different parts of the world will continue to live in a future that is unfolding without the necessary scaffolding against the many threats to humanity that eclipse their dream of a better urban future. It is therefore in the interest of countries that urban futures embody a well-functioning system of cities alongside institutions that can cope with future crises and prepare for a societal reset. Such cities can help galvanize resources from multiple sources to invest in robust health infrastructure as part of city resilience development programmes, including urban development, management and governance.[33]

The pandemic has raised the profile of cities even further as being key to building more resilient and inclusive societies, and central to countries' recovery strategies.[34] Beyond the primary concern of the public health emergency and containing the virus to protect societies, as shown in Chapter 7, the pandemic has compelled cities to reconsider how spaces are planned and used, how services are delivered and how equitable development and economic growth can be resumed to achieve more just, inclusive and equitable societies.

The future of cities is one that should embody the fundamental principles of human rights, greater equality, trust, compassion and solidarity. Building economic, social and environmental resilience, including appropriate governance and institutional structures, must be at the heart of the future of cities. Economic resilience with new fiscal sustainability frameworks, societal resilience with universal social protection schemes, climate resilience with greener investments and stronger multilevel collaboration to confront future shocks – these elements must be the main building blocks of a resilient future that can withstand and respond to the various threats and shocks that urban areas face.

1.3 The Diversity of Urban Futures

The future of cities is inextricably linked to the diversity or plurality of the urban context, which varies in terms of the nature and scale of urbanization, demographic size, socio-spatial configuration of settlements, economic composition and linkages to the global economy, degree of informality, culture, local challenges, and local political and institutional

Table 1.2: Urban population and level of urbanization (2015–2050)

Region	Urban population (million)								Percentage urban							
	2015	2020	2025	2030	2035	2040	2045	2050	2015	2020	2025	2030	2035	2040	2045	2050
World	3 981	4 378	4 774	5 167	5 555	5 938	6 312	6 680	53.9	56.2	58.3	60.4	62.5	64.5	66.4	68.4
More developed regions	979	1 003	1 027	1 049	1 070	1 090	1 108	1 124	78.1	79.1	80.2	81.4	82.7	84	85.4	86.6
Less developed regions	3 002	3 375	3 747	4 117	4 485	4 847	5 204	5 556	49	51.7	54.3	56.7	59	61.3	63.4	65.6
Africa	491	587	698	824	966	1 125	1 299	1 489	41.2	43.5	45.9	48.4	50.9	53.6	56.2	58.9
Asia	2 119	2 361	2 589	2 802	2 998	3 176	3 335	3 479	48	51.1	54	56.7	59.2	61.6	63.9	66.2
Europe	547	556	565	572	580	587	593	599	73.9	74.9	76.1	77.5	79	80.6	82.2	83.7
Latin America and the Caribbean	505	539	571	600	626	649	669	685	79.9	81.2	82.4	83.6	84.7	85.8	86.9	87.8
North America	290	304	319	334	349	362	375	386	81.6	82.6	83.6	84.7	85.8	86.9	88	89
Oceania	26	28	30	32	34	36	39	41	68.1	68.2	68.5	68.9	69.4	70.2	71.1	72.1

Source: UNDESA, 2019b.

Table 1.3: Urban rate of change 2015–2050

Region	Average Annual Rate of Change of the Urban Population (per cent)							Entire Period
	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040	2040-2045	2045-2050	2015-2055
World	1.90	1.73	1.58	1.45	1.33	1.22	1.13	1.48
More developed regions	0.50	0.46	0.44	0.40	0.36	0.32	0.28	0.39
Less developed regions	2.34	2.09	1.88	1.71	1.56	1.42	1.31	2.09
Africa	3.58	3.44	3.32	3.19	3.04	2.89	2.71	3.17
Asia	2.16	1.84	1.58	1.35	1.15	0.98	0.84	1.41
Europe	0.35	0.30	0.28	0.26	0.25	0.22	0.17	0.26
Latin America and the Caribbean	1.30	1.15	1.00	0.85	0.72	0.59	0.47	0.87
North America	0.95	0.96	0.92	0.84	0.75	0.67	0.62	0.82
Oceania	1.42	1.30	1.24	1.18	1.15	1.12	1.07	0.89

Source: UNDESA, 2019b.

systems.[35] Every major region of the world has its unique features and development outcomes, which must be reflected in polices for achieving better urban futures. Ideally, this diversity implies that every city will have to design its future journey to reflect the unique combination of opportunities and constraints that it faces.[36] Urbanization will continue to be a transformative, but uneven process that will require differentiated responses. At the same time, there are areas of convergence across the urban context. Cities create wealth, enhance development, fulfil aspirations, harness human progress and increasingly deploy new technologies to address diverse challenges. The future of cities should reflect to varying degrees the challenges and opportunities that cities face.

This section explores the diversity of urbanization in different contexts with a view to drawing out the implications for the future of cities. The issues to be addressed in the future of cities can be classified into two broad categories: those that affect developed and developing countries. There are overlaps within such simplified categorization, which is not intended to be exhaustive but rather illustrative of some of the trends and challenges of the diversity of the urban context in different settings to which the future of cities must address.[37]

1.3.1 The state of urbanization in developed regions

While the global urban transition witnessed over the last three decades has been phenomenal, the level, pace and processes driving urbanization are uneven across the world. The process of urbanization is much advanced in the developed regions of the world where 79 per cent of the population reside in urban areas (Table 1.2). This trend will continue, albeit slowly, as 87 per cent population is expected to be urban by 2050. While the level of urbanization in developed countries is high, the rate of urban population growth is low, declining and even negative in some countries. Urban population is expected to grow at 0.46 per cent annually between 2020 and 2025 and 0.40 per cent between 2030 and 2035 (Table 1.3).

Current and expected urban growth in the developed world will be driven partly by international migration, mainly from developing countries, which accounts for about one-third of urban growth,[38] and for 55 per cent of the global migration stock.[39] This trend will continue into the foreseeable future since the population in most developing countries is expected to increase in the decades to come, thus placing migration pressure on future generations.[40] Increasing waves of international migration have meant that urban areas in all parts of the world are increasingly becoming multicultural, which both enriches cities and brings new challenges.

While cities can generate a lower ecological footprint per capita when they follow compact urban development patterns, the high rates of urbanization in developed regions

The future of cities should reflect to varying degrees the challenges and opportunities that cities face

do not always translate to environmentally sustainable urban form. Urban areas in developed regions, particularly the US, have the largest ecological footprints in the world. High levels of resource consumption, widespread dependence on private automobiles, large-scale waste generation and low-density suburban sprawl eroding agricultural land are all key environmental issues for the future of cities in developed regions. Urban densities in developed countries have been declining, thus aggravating the problem of urban sprawl.[41] Findings from a global sample of cities with over 100,000 inhabitants show that between 2000 and 2015, the physical extent of urban areas in North America and Europe grew much faster than their population, thereby consuming more land for urban development.[42] This trend has profound implications for energy consumption, greenhouse gas emissions, climate change and environmental degradation.

1.3.2 Urban priorities for the future of cities in developed countries

The urban conditions, trends and processes in developed countries suggest certain key issues that should be addressed in the transition to more sustainable urban futures. These are highted below and discussed in greater detail in different chapters.

Inequality and social exclusion

Over the past four decades, rising inequality especially in urban areas has been widespread in developed countries. Consequently, social exclusion, urban segregation and persistent pockets of destitution and poverty are increasingly common features in cities of developed countries (Chapter 3). Nonetheless, levels of inequality in developed countries are generally lower than in developing countries, which indicates greater access to public goods and services and the existence of institutions that implement more egalitarian polices. While the levels of inequality across Western Europe have been widening since the 1980s, this region remains the most egalitarian in the world. Conversely, the US has the highest income inequality among developed countries and is currently experiencing its highest levels of inequality in the last 50 years.[43] The most unequal US cities have become more unequal, as eight of the ten most unequal cities experienced an increase in their Gini coefficients between 2010 and 2018.[44]

Over the past four decades, rising inequality especially in urban areas has been widespread in developed countries

A key issue to be addressed in cities of developed countries are manifestations of the various forms of exclusion and marginalization that migrants and other minority groups face, many of which have been worsened by the impacts of COVID-19.[45] Developed countries can address the systemic inequality in urban areas through a wide range of policies aimed at creating more equitable cities as discussed in Chapter 3.

Climate change and environmental issues

Climate change remains a top priority in the global development agenda. Developed and leading industrial countries will have to play a key role in addressing the challenge of climate change as only a handful of countries have strengthened their targets to reduce emissions. In Europe, 70 per cent of cities are in low-lying areas less than ten metres above sea level. Except for the Baltic coastline, a majority of European cities have experienced an increase in sea levels and this risk is projected to increase along with global sea-level rise.[46] North American cities are also at risk, especially those on the Gulf of Mexico and Atlantic seaboard, with more than 90 cities experiencing regular flooding, a number that is set to double by 2030.[47] The New Urban Agenda envisions future cities and human settlements that build resilience and reduce their disaster risk while simultaneously promoting clean energy and pursuing sustainable consumption and production patterns in order to protect ecosystems and preserve biodiversity.[48]

Addressing cultural diversity

Growing waves of international migration have meant that urban areas in developed countries are increasingly transformed into heterogenous, multi-ethnic, multicultural and multilingual spaces. Among the most culturally diverse cities are San Francisco, US; Sydney, Australia; New York; London, UK; Toronto, Canada; and Brussels, Belgium. In these cities, foreign-born residents account for 35–58 per cent of their population.[49] Megacities in developed countries have become microcosms of the world at large. For instance, the 4 million workers in London speak more than 240 languages.[50] Migrant populations offer significant creative cultural contributions and open new opportunities for shrinking cities in Europe and North America, which have experienced deindustrialization, ageing populations and low birth rates.[51] Over the past 15 years immigrants have accounted for 47 per cent of the increase in the workforce in the US and 70 per cent in Europe.[52]

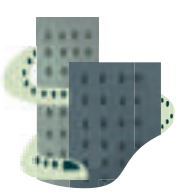
Experience shows that managing diversity occurs at the local level through everyday experiences and encounters. The importance of neighbourhood context and relationships

Repair work in the city to replace water pipes in the city of Samara, Russia © Shutterstock

formed at the micro level are key ingredients for social harmony across racial, ethnic, religious and linguistic backgrounds. In addition, public policies can help integrate new arrivals like migrants, refugees and internally displaced persons into their host communities. Culturally-sensitive design and social supports can strengthen a sense of identity and belonging, thus transforming migration from a potential societal strain into an asset that can lead to urban regeneration and revitalization.

Ageing stock of urban infrastructure

One of the most important needs for all urban futures in developed countries is upgrading and modernization of their ageing stock of physical infrastructure – bridges, power transmission and distribution systems, water and sewerage pipelines, and sustainable transport infrastructure.[53] The challenge of ageing infrastructure arises from growth demands, rapid urbanization and development booms. Among developed countries only Australia and Japan have invested sufficiently over the years to meet or exceed their infrastructure needs.[54] Conversely, Germany, the UK, and the US face major gaps to meet their current urban infrastructure spending commitments.[55] The city of New York has more than 1,000 miles of water pipe over 100 years old and its ageing sewer system is a major contributing factor to flooding.[56] London's iconic public transport system, the Underground, has passed its centennial anniversary and its managers have warned that they may enter a period of "managed decline" in 2023 without national funding commitments.[57]



One of the most important needs for all urban futures in developed countries is upgrading and modernization of their ageing stock of physical infrastructure

Shrinking cities

Nearly half of the cities in developed regions are shrinking. Most of the 52 cities globally that have experienced population decline since 2000 are in Europe and North America (Figure 1.2). These cities were home to 59 million people in 2018, down from more than 62 million in 2000. Shrinking cities are the outcome of a decline in the regional economy or cities' economic base with the population migrating elsewhere. In the US, more than 40 per cent of cities with at least 10,000 residents have lost population between 1980 and 2010.[58] These cities are located mostly in the deindustrialized region known as the Rust Belt, where population loss has led to high rates of unemployment, blight and violent crime. Unlike in some post-industrial regions of Europe, shrinkage in US conurbations occurs largely in the urban core, while suburban regions continue to grow.[59]

Figure 1.2: Cities where the population declined between 2000 and 2018

Source: UNDESA, 2018a.

Urban shrinkage generates vast challenges such as how to sustain the cost of under-utilized infrastructure and address the negative effects of urban blight that come with huge swathes of vacant housing units, as well as commercial and industrial facilities. Shrinking cities pose an urban governance challenge of managing decline in a smart way to ensure that public services such as education or healthcare are still available to residents in the face of budget constraints.[60] However, the low cost of land and abundance of existing building stock also makes shrinking cities places of opportunity for enterprising and creative architects, artists, designers and entrepreneurs.

Ageing population

In addition to shrinking cities, developed countries have experienced population ageing. In Europe, the ratio of the size of the working-age population (aged between 20 and 64 years) relative to the total number of older persons (aged 65 years or over) fell from 3.9 in 2001 to 2.9 by 2020; this ratio is predicted to decrease to 1.6 by 2080.[61] Such demographic shifts can have significant implications for government revenue, pension funds, healthcare and social services. An ageing population can also lead to labour supply shortages and economic decline.[62] It is therefore critical that these issues are factored into decision-making and planning for the future of cities. In planning for a growing older population, cities across the region are beginning to support active ageing by creating public spaces, transport and buildings that are accessible for people with restricted mobility.

Economic restructuring

Over the last few decades, developed countries have witnessed the process of industrial relocation as firms seeking to reduce labour and operating costs have relocated to developing countries or to less developed areas within the developed world.[63] In many cities, jobs in heavy manufacturing and mining have disappeared entirely on account of deindustrialization, economic restructuring and globalization. Secondary cities in developed countries have been particularly affected by these changes because of their less diversified economies, as they are often dependent on a single sector such as traditional manufacturing or raw material-based industries. These cities have faced challenges in adjusting to the decline in manufacturing as few have successfully revitalized and diversified their economies in order to retain capital, human resource and attract investment.[64] In the absence of bold economic recovery programmes, the prognosis for this group of cities appears pessimistic. As urban analysts note: "These problems threaten to persist into the future, as declining cities face outmigration and become increasingly disadvantaged and disconnected from their national system of cities".[65]

1.3.3 The state of urbanization in developing regions

In developing regions, 52 per cent of the population currently reside in urban areas. This figure is expected to grow to 57 per cent in 2030 and to 66 per cent in 2050 (Table 1.1). Developing countries have the fastest rate of urbanization, with an annual urban growth rate averaging 2.1 per cent between 2020 and 2025. The implication of this trend is that future urban growth will take place mainly in the developing regions of Africa and Asia, where the planning systems and public institutions are least equipped to deal with the challenges of rapid urbanization.

Urbanization in the developing regions demonstrates considerable diversity. Latin America and the Caribbean, with 81 per cent of its population living in urban areas, has four of the world's largest megacities: Mexico City, Mexico; São Paulo, Brazil; Buenos Aires, Argentina; and Rio de Janeiro, Brazil. These megacities alone account for 17 per cent of the region's urban population and attract most of the foreign investment.[66] While cities in the region have become more egalitarian in the last two decades, income inequality remains relatively high. Latin America and the Caribbean is the only region where migration between urban areas is a significant driver of urban growth, accounting for nearly 50 per cent and due to several factors, with the pursuit of livelihoods being the most important.[67]

Africa is the least urbanized, but most rapidly urbanizing, region in the world. Currently, 44 per cent of the region's population resides in urban areas (Table 1.1). By 2035, the region will have half of its population living in cities and will be predominantly urban by 2050 with six in ten persons living in urban areas. Urban growth rates in Africa currently stand at 3.4 per cent. While projected to decline in the years ahead, urban growth in Africa will remain the highest of any region. In many African countries, urbanization is occurring at lower levels of income compared to other developing regions.[68] This phenomenon has been referred to as the weakening of the historical link between urbanization and prosperity.[69] Urbanization is also taking place within the context of rising unemployment, financially weak municipal authorities, weak governance structures, increasing levels of poverty and inequality, proliferation of slums and other forms of vulnerability. These are some of the key issues that will dominate the future of cities in the region.

future urban growth will take place mainly in the developing regions of Africa and Asia, where the planning systems and public institutions are least equipped to deal with the challenges of rapid urbanization

Asia and the Pacific has 51 per cent of its population living in urban areas and accounts for 54 per cent of the world's urban population.[70] By 2050, it is expected that about two-thirds of the region's population will be living in urban areas. While Asia is one of the most rapidly urbanizing regions of the world, urban population growth has been declining since the 1980s, from an annual average of 3.83 per cent to the present rate of 1.84 per cent (Table 1.2). The process of urbanization in Asia is driven mainly by rural-urban migration. Urbanization in the region, especially South-East Asia, is strongly linked to economic transition and greater integration into the global economy, as many cities have become recipients of foreign direct investment, mainly in the form of the outsourcing of manufacturing by parent companies in developed countries.[71] Despite the large number of megacities (18 if Japan is included and 16 if excluded), 54 per cent of Asia's urban population live in cities of less than 1 million people, while 16 per cent reside in megacities. This fact is a clear indication that the agenda for the future of cities in the region should in part focus on the key issues relating to secondary cities, in addition to those of megacities.

1.3.4. Urban priorities for the future of cities in developing countries

The diversity of the urban context in developing countries suggest certain key issues that should be addressed in the future of cities. These are briefly described below and discussed in greater detail in different chapters.

Poverty and inequality

As cities in developing countries seek better urban futures, poverty remains a persistent challenge that must be addressed (Chapter 3). It is estimated that one-third of all urban residents are poor, which represents one-quarter of the world's total poor with the majority residing in small cities and towns in developing countries.[72] Based on historic trends, extreme poverty is projected to decline to 6 per cent by 2030.[73] However, COVID-19 has exacerbated poverty levels, thereby leaving the poor further behind and increasing the number of those newly living in poverty.[74]

One projection of the increase in poverty due to COVID-19 estimates that as much as 500 million people or 8 per cent of the world's population fell into poverty.[75] This decline marks

the first increase in global poverty of the last three decades. Countries in developing regions also have the highest levels of inequality. Inequality disproportionately affects vulnerable groups like women and girls, older persons, indigenous people, persons with disabilities, migrants, refugees and people living in poverty, all of whom are excluded from full participation in economic, political and social life (Chapter 3). As shown elsewhere, the outbreak of the COVID-19 pandemic has exacerbated these inequalities.[76]

Infrastructure, housing and the challenge of slums

Cities in developing countries face the challenge of providing adequate infrastructure and basic services, without which a better urban future can be difficult to attain. The provision of infrastructure and basic services in developing countries is still very poor. For the hundreds of millions of low-income and poor households, improved water and sanitation remain a rarity; well-funded public education and quality healthcare are unavailable; and access to safe and affordable transport services, leisure and open space are minimal.[77] The lowest levels of infrastructure provision are to be found in Africa, where of the urban population, only 54 per cent have access to safely managed water and only 23 per cent have access to sanitation. For Latin America and the Caribbean, 81 per cent of the region's urban population has access to safely managed water and 40 per cent have access to sanitation.[78] These averages mask huge intra-urban differences between well-off districts and poor neighbourhoods that lack the most basic of services, all of which contributes to the vulnerability of already marginalized settlements. Investing in infrastructure is therefore an absolute necessity for the future of cities in developing countries.

Cities in developing countries face the challenge of providing adequate infrastructure and basic services, without which a better urban future can be difficult to attain

Affordable and adequate housing remains an illusion for many in developing countries. The inaccessibility of this basic human need is reflected in the growth of slums,[79]

People living in slum, Mumbai, India © Shutterstock

which forms part of the unfinished business of the urban agenda that needs to be addressed going forward especially in Africa and South Asia. Slums are one of the most enduring faces of poverty, inequality, exclusion and deprivation. Slum dwellers must contend with inadequate access to potable water, poor sanitation, overcrowding, poor-quality housing in hazardous locations, insecure tenure, risk of eviction, food insecurity, malnutrition, poor health, unemployment and stigmatization, all of which make them highly vulnerable to COVID-19 and other shocks.[80]

While remarkable progress has been made in reducing the proportion of the world's urban population living in slums from 28 per cent in 2000 to 24 per cent in 2018, more than 1 billion people still live in such settlements with over half of slum dwellers located in East, South-East, Central and South Asia, and 23 per cent in Sub-Saharan Africa.[81] The forces driving the prevalence of slums in developing regions are unplanned urbanization; ineffective planning; lack of affordable housing options for low-income households; dysfunctional urban, land and housing policies; a dearth of housing finance; and poverty and low incomes. All these factors must be addressed decisively and with the political will that they deserve if cities are to meet their housing needs going forward.

Challenge of climate change

Rapidly urbanizing cities in developing countries are more vulnerable to climate change and least able to respond to its effects. They are hampered by limited financial, human and technical resources as well as weak institutions and governance structures for disaster mitigation and preparedness. At the same time, these cities contribute very little to global warming, making their suffering disproportionate. Cities, especially those in warm climates or low-lying coastal areas, face existential threats due to the risks and impacts of climate change and extreme weather events such as increased heatwaves in Delhi, India, and the pervasive flooding in Jakarta, Indonesia, and Durban, South Africa.

In developing countries, the effects of climate change can exacerbate existing urban challenges and make it more difficult to tackle the persistent issues that cities already face, such as poverty, inequality, infrastructure deficits and housing, among others.[82] These challenges could make it difficult to achieve certain SDGs, especially those relating to poverty, hunger, health, water, sanitation and ecosystems. The long-term effects of climate change could combine with the short-term impacts of the COVID-19 pandemic to further reverse global development gains.

Rapidly urbanizing cities in developing countries are more vulnerable to climate change and least able to respond to its effects

Youth bulge

Many developing countries are characterized by a significant increase in the proportion of persons aged 15 to 24, which is referred to as the youth bulge. There are 1.19 billion people within this age bracket worldwide with 88 per cent in developing countries in 2015.[83] A high youth bulge presents the challenge of youth unemployment, which is two to three times higher that adult unemployment. A youth bulge can represent a potential opportunity to spur social and economic development if countries harness the power of age-structure transformation. The youth bulge can also increase the risk of domestic conflict in an urban context of weak governance, poor economic performance and high levels of inequalities.[84] A youthful population requires investment in educational, employment training, recreational and community facilities. Countries will also need to integrate various aspects of demographic change in their urban development policies, particularly the youth bulge observed in many developing countries.

Investing in secondary cities

Secondary cities of less than 1 million inhabitants account for 55 per cent of the urban population of the less developed regions of the world.[85] Indeed, the fastest growing cities are the small and intermediate cities and towns. Despite their demographic importance, planning and policy initiatives in developing countries have focused mainly on large metropolitan areas, thereby further fuelling urban primacy. Residents of secondary cities endure multiple deprivations and infrastructure deficiency on account of this metropolitan bias. The COVID-19 pandemic has demonstrated that secondary cities are vulnerable to these external shocks because of deficits in infrastructure and services.

With adequate planning, management and governance, secondary cities will foster better urban-rural linkages and relieve some of the quality-of-life strain, such as rampant informal settlements, environmental degradation and long commutes, that can be endemic to megacities. As noted earlier, secondary cities served as subregional hubs in supporting post-COVID-19 recovery efforts.[86] If secondary cities are to form part of the agenda for the future of cities in developing countries, governments must prioritize

investment in infrastructure and service delivery to address these issues and close the widening urban services divide.

1.4 Possible Scenarios for Urban Futures

Though the future cannot be predicted with certainty, the current trends across the key themes covered in this report (urban poverty and inequality, urban economies, urban governance, urban and territorial planning, public health, innovation and technology and building resilience) have significant bearing on the future of cities. Based on the analysis of available data and current trends provided in this Report, the three scenarios of urban futures are possible (Figure 1.3).

1.4.1 The high damage scenario

This is the worst-case scenario that can occur with disastrous consequences for the future of cities. Under the "high damage" scenario, the impacts of the ongoing COVID-19 pandemic as well as global economic uncertainties, environmental challenges, and wars and conflicts in different parts of the world could have long-term impacts on cities in both developed and developing countries. In this scenario, developing regions bear the brunt of this catastrophic damage because of already existing vulnerabilities and structural fragilities as discussed in Chapters 1 and 3.

Under the high damage scenario, if 80 per cent of the economic damage inflicted by the COVID-19 pandemic persists for a decade then the global poverty headcount could increase by 32 per cent or 213 million people by 2030.[87] Even in 2050 the increase in the number of people living in poverty is projected to be over 200 million.[88] The repercussions of this scenario have significant gender dimensions: 90 million women and girls were pushed into poverty in 2020, a figure that is expected to reach 105.3 million by 2030. These COVID-19 induced dynamics have lasting implications for the ability of countries to achieve the targets of SDG 1. Currently in most developing countries, the pandemic has weakened the fiscal capacity of cities and subnational governments to tackle poverty and other urban challenges. The sheer amount of homelessness and concentrated urban poverty in some developed country cities could potentially escalate to alarming levels and marginalized groups such as minorities, indigenous peoples and migrants could endure multiple deprivations for decades to come.

in most developing countries, the pandemic has weakened the fiscal capacity of cities and subnational governments to tackle poverty and other urban challenges

In a worst-case scenario, especially if the global rise in inflation and cost of living does not abate, the impact on urban economies would be disastrous (Chapter 4). For instance, cities in Africa could lose up to two-thirds of their financial resources,[89] which will make it progressively difficult to meet the basic needs of their population at a time when price hikes have sent the cost of food, energy and commodities soaring. The impact on urban economies will be most intensely felt in cities that are already enduring multiple social, economic, political and environmental fragilities such as such as Juba, South Sudan; Sanaa, Yemen; and Aleppo, Syria, among others. If the impact of the pandemic and global challenges continues unabated, then already weak urban service delivery and governance systems in some of these cities could collapse entirely (Chapter 8). A majority of those in developing regions are already trapped in a vicious cycle of poverty. It will be extremely difficult if not impossible to achieve SDG targets in the face of massive material deprivation, weak urban economies, high unemployment especially among youth, a growing digital divide (Chapter 9), worsening vulnerability to public health crises (Chapter 7), perpetual violent conflict and any additional shocks or stresses. The high damage scenario would create fertile grounds for amplifying these vulnerabilities, making it hard for urban leaders to manage multiple urban crises and promote cities that work for all.

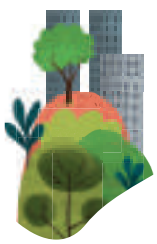
A high damage scenario would also result in a massive reduction in official development assistance to poor countries, which means that less funding could therefore be available for state initiated urban development and infrastructure projects, which in turn will negatively affect the implementation of urban development programmes targeted at improving the lives of ordinary citizens. Under the high damage scenario, urban futures will be characterized by high levels of poverty and inequality, weak urban economic growth especially in poorer regions and insufficient resilience to risks like climate change and pandemics (Chapter 10). If global action against multiple urban challenges fails and this bleak scenario becomes a reality, the credibility of the multilateral system would be compromised, thereby undermining coordination efforts to address urgent and pressing global issues.

Figure 1.3: Possible Scenarios for Urban Futures

Key Themes

- URBAN POVERTY & INEQUALITY
- URBAN ECONOMIES
- CLIMATE CHANGE & CITIES
- URBAN PLANNING
- URBAN HEALTH
- URBAN GOVERNANCE
- INNOVATION & TECHNOLOGY
- BUILDING URBAN RESILIENCE

Current Trends in Cities	High Damage Scenario	Pessimistic Scenario	Optimistic Scenario
▪ Urban poverty and inequality remain a major feature in cities ▪ Urban economies vulnerable to shocks and stresses-especially in developing country cities ▪ Fragmented and weak institutional frameworks to tackle multiple, complex, and interrelated urban challenges ▪ Continuing urban heath inequities	Unimaginable reversal of development gains, particularly in poorer regions resulting in missing of SDG targets Millions could be pushed into extreme poverty-with women, children, migrants, refugees, indigenous peoples, and other disadvantaged groups bearing the brunt of this crisis Political upheavals and pandemics could amplify poverty, food insecurity to unmanageable levels Massive expansion of slum-like conditions in poorer regions, which could expose millions of people to the wrath of public health crises The looming climate emergency could trigger calamitous damage which could generate additional urban crises in both developed and developing country cities. Failure to build climate resilience could be severely damaging to urban economies	"Bad Old Deal"- Characterized by exploitation and perpetual exclusion of informal sector workers, systemic discrimination, and exclusion of the urban poor in urban development agendas Severely weakened urban economies Cities could be locked into cycles of poverty, poor productivity, unhealthy living conditions and potentially become inequality traps for decades 'New' forms of urban vulnerabilities in the future that would disproportionately affect already disadvantaged groups (e.g. migrants and refugees, slum dwellers, the homeless, women, children, and indigenous people)	Concerted efforts and transformative action to achieve SDG targets and the New Urban Agenda Reprioritization of the most vulnerable and disadvantaged urban populations in urban planning and development, urban governance, technology-based projects and climate action plans Desirable outcomes that have long-term expectations for cities to be equitable and inclusive, productive, green, compact, walkable, and healthy, resilient urban development as called for by the global development agenda relevant to sustainable urbanization.
▪ Urban planning and management remain poor in most parts of the world, especially in developing regions ▪ Rapid digitization of urban economies and adoption of ICTs- creating digital inequalities ▪ Climate crisis severely affecting urban economies through infrastructure damage and livelihoods disruptions- especially in coastal cities and in contexts where resilience to climate shocks is relatively weak ▪ Poor households and communities, including those living in slums are still severely affected by multiple shocks and risks that negatively affect their resilience			



Key Actions for A Better Urban Future

Collective and concerted multilateral interventions through tailored support to poor countries to build resilience of cities to multiple crises

Institutional and governance reforms to implement redistributive policies to address escalating urban poverty and inequalities

Prioritization of climate resilience and greening for resilient and sustainable urban futures- ***building resilience must be forward looking, multisectoral and inclusive of all stakeholders, especially the poor and most vulnerable***

Investment towards resilient urban economies and productive urban futures in both developed and developing regions

Capacity building for responsive and sustainable urban and territorial planning

Strong linkages between public health and urban interventions, especially in disadvantaged locales such as slums and informal settlements

1.4.2 The pessimistic scenario

This scenario is likely to materialize if cities and subnational governments return to the pre-pandemic business-as-usual approach, what one development practitioner calls the "Bad Old Deal."[90] This system is characterized by exploitation and perpetual exclusion of informal sector workers (Chapters 3 and 4), systemic discrimination and exclusion of the urban poor in urban agendas (Chapter 3), overreliance on fossil fuels to support manufacturing industries (Chapter 5), poorly planned and managed urbanization processes particularly in developing regions (Chapter 6), poor prioritization of public health interventions in urban development (Chapter 7), rapid deployment of modern technologies without opportunities for the poor and thereby creating and entrenching digital inequalities (Chapter 9). Collectively, these challenges will undermine the global vision of achieving inclusive, resilient, and sustainable cities where no one is left behind.

The pessimistic scenario could also have dire consequences in regions that already face multiple instabilities. For example, in Africa, more than 20 per cent of the urban population will endure extreme poverty between 2016 and 2030 in countries such as Madagascar, Chad, Central African Republic, South Sudan and Democratic Republic of the Congo.[91] Globally, 1.6 billion people or 20 per cent of the world's population live in inadequate housing, of which 1 billion reside in slums and informal settlements.[92] Under these conditions, the goal of eradicating poverty in all its forms by 2030 and leaving no one behind will not be achieved. Without concerted efforts, the pessimistic scenario could lead to new forms of urban vulnerabilities that would disproportionately affect already disadvantaged groups. Moreover, as the climate emergency looms, the resilience of cities to shocks and stresses is being tested, especially those located in coastal regions. There are already warning signs globally and further inaction on these multiple crises could jeopardize the prospects for resilient, thriving and sustainable urban futures. Finally, the revised downward growth rates for 2022 and 2023, brought on by supply chain stresses and the conflict in Ukraine, will continue to cause economic hardship under the pessimistic scenario as households struggle with higher prices for food, energy and basic goods while wages do not keep up with inflation.[93]

As the climate emergency looms, the resilience of cities to shocks and stresses is being tested, especially those located in coastal regions

1.4.3 The optimistic scenario

The optimistic scenario provides a vision where concerted policy action facilitated by the implementation of the New Urban Agenda as a framework for achieving the SDGs is amplified to make transformative progress in addressing multiple challenges confronting cities in both developed and developing regions. This scenario involves collaborative, well-coordinated and effective multilateral interventions to tackle multidimensional poverty and inequalities (SDG 1 and SDG 10, see Chapter 3), promote vibrant resilient and diversified urban economies and productive urban futures (SDG 8 and SDG11, see Chapters 4 and 10), build healthy and thriving cities (Chapter 7), strengthen the drive towards green urban futures (Chapter 5), promote well-planned and managed urbanization processes (SDG 11, see Chapter 6) and ensure inclusive digital economies for the future (Chapter 9).

In the optimistic scenario, national and local governments invest in the Decade of Action to reset the urban development path towards a just, resilient, healthy and prosperous urban future. Under this scenario, the world will meet the SDG target of a poverty rate below 3 per cent at the global level in 2045. If countries embark on the SDG Push proposed by the United Nations Development Programme to exceed pre-pandemic development trajectories, then there will be 125 million fewer people in poverty than in the pre-COVID baseline. By 2050, that figure grows to more than 260 million.[94] Under the optimistic scenario, national governments will embrace peace and diplomacy to resolve their differences rather than pursue military action, especially in instances that have global economic consequences like the conflict in Ukraine, thus alleviating pressure on global energy and food markets. In the optimistic scenario, governments are also successful at managing the COVID-19 pandemic to balance health outcomes with economic activity and citizen rights, thus smoothing out global supply chains.

The optimistic scenario will not materialize automatically. It requires commitment from leaders at the global, regional, national and local levels. Going forward, the drive towards an SDG push in cities must be accompanied by brave commitments to tackle structural inequalities and create conditions that foster social, economic and spatial inclusion to ensure that no one is left behind. If appropriate measures are implemented, the response to the current urban crisis can lead to a collective reprioritization of cities across the world towards shared prosperity, inclusion, productive employment, innovation, environmental sustainability, gender-responsive systems and cohesive community building.

1.5 Visions of Urban Futures

The unprecedented global impacts and disruption triggered by the COVID-19 pandemic – much of which have played out in urban areas – compel us to reimagine the future of cities and reflect on the type of cities that are needed to support humanity in a predominantly urban world. What do we want our cities to look like, especially in the aftermath of the COVID-19 pandemic, and how can cities prepare for an uncertain future? The vision of the future of cities should be guided by the norms of the New Urban Agenda and the 2030 Agenda for Sustainable Development, especially SDG 11. Other global frameworks are also relevant to sustainable urbanization: the Paris Agreement on Climate Change, the Sendai Framework for Disaster Risk Reduction and the Addis Ababa Action Agenda. While this framework was already in place, the COVID-19 pandemic has added a sense of urgency and a demand for a change on the journey towards more sustainable urban futures.

The vision of the future of cities should be guided by the norms of the New Urban Agenda and the 2030 Agenda for Sustainable Development, especially SDG 11

The call in the New Urban Agenda of "cities for all" is a people-centred urban development vision that protects the planet, is age- and gender-responsive, enhances the realization of human rights and fundamental freedoms, facilitates living together, ends all forms of discrimination and violence, reduces social and economic inequalities, and empowers all individuals and communities, while enabling their full and meaningful participation (Box 1.3). Indeed, the New Urban Agenda offers a global vision for people, the planet and long-term prosperity in which urbanization plays a vital role for positive change.

Vienna has a convenient transport system and facilities, Vienna, Austria © Shutterstock

Box 1.3: The Vision of "Cities for All"

The vision of cities for all envisages cities and human settlements that:

i. Fulfil their social function, including the social and ecological function of land, with a view to progressively achieving the full realization of the right to adequate housing as a component of the right to an adequate standard of living, without discrimination, universal access to safe and affordable drinking water and sanitation, as well as equal access for all to public goods and quality services in areas such as food security and nutrition, health, education, infrastructure, mobility and transportation, energy, air quality and livelihoods.

ii. Are participatory; promote civic engagement; engender a sense of belonging and ownership among all their inhabitants; prioritize safe, inclusive, accessible, green and quality public spaces friendly for families; enhance social and intergenerational interactions, cultural expressions and political participation, as appropriate; and foster social cohesion, inclusion and safety in peaceful and pluralistic societies, where the needs of all inhabitants are met, recognizing the specific needs of those in vulnerable situations.

iii. Achieve gender equality and empower all women and girls by ensuring women's full and effective participation and equal rights in all fields and in leadership at all levels of decision-making; by ensuring decent work and equal pay for equal work, or work of equal value, for all women; and by preventing and eliminating all forms of discrimination, violence and harassment against women and girls in private and public spaces.

iv. Meet the challenges and opportunities of present and future sustained, inclusive and sustainable economic growth, leveraging urbanization for structural transformation, high productivity, value-added activities and resource efficiency, harnessing local economies, and taking note of the contribution of the informal economy while supporting a sustainable transition to the formal economy.

v. Fulfil their territorial functions across administrative boundaries, and act as hubs and drivers for balanced, sustainable and integrated urban and territorial development at all levels.

vi. Promote age- and gender-responsive planning and investment for sustainable, safe and accessible urban mobility for all, and resource-efficient transport systems for passengers and freight, effectively linking people, places, goods, services and economic opportunities.

vii. Adopt and implement disaster risk reduction and management, reduce vulnerability, build resilience and responsiveness to natural and human-made hazards, and foster mitigation of and adaptation to climate change.

viii. Protect, conserve, restore and promote their ecosystems, water, natural habitats and biodiversity, minimize their environmental impact, and change to sustainable consumption and production patterns.

Source: United Nations, 2017.

The New Urban Agenda seeks to foster an enabling environment that empowers cities to achieve core developmental, environmental and other commitments.[95] This approach is a notable departure from previous global agendas as the importance of cross-scale governance rather than top-down implementation is clearly recognized.[96] A significant precedent is the explicit recognition of the centrality of subnational entities, particularly cities, in national and international systems for driving sustainability.[97]

The magnitude of the devastation of a global shock such as the current pandemic could not have been anticipated when the New Urban Agenda was adopted in 2016. The pandemic can therefore be seen as a defining feature of our global landscape,

which has major implications for the future of cities and for implementation of the New Urban Agenda. The UN-Habitat report Cities and Pandemics: Towards a More Just, Green and Healthy Future identifies some shortfalls of the New Urban Agenda and its implementation regarding COVID-19.[98] These oversights include insufficient comprehension of the extent of poverty and inequality globally that has since been exposed by the pandemic; the new vulnerabilities generated by an extreme health crisis that were not anticipated, which necessitate a more explicit human rights-based approach grounded on the principles of social and economic justice; and inadequate recognition of the importance of digital access and infrastructure investments necessary for the creation of inclusive and sustainable urban economies.

New Urban Agenda along with its guiding principles, transformative commitments and means of implementation remain pertinent to fostering resilient urban futures

Nonetheless, the New Urban Agenda along with its guiding principles, transformative commitments and means of implementation remain pertinent to fostering resilient urban futures. Indeed, many of the policies and blueprints being proposed to address the impacts of the COVID-19 pandemic in cities are embedded in the New Urban Agenda and other global frameworks relevant to sustainable urbanization. What is then required is the effective implementation of these development frameworks, backed by adequate resources.[99]

1.5.1 New social contract: an emerging vision for the future of cities?

Following the disruptions wrought by the COVID-19 pandemic, an emerging vision of urban futures is that of a more equitable and just city, one that is greener and more knowledge-based and is resilient across multiple dimensions to different types of shocks, crises and catastrophes. The pandemic has forced a renewed reflection on the form and function of cities, connectivity, managed density and prevention of overcrowding. It has also caused the public

an emerging vision of urban futures is that of a more equitable and just city, one that is greener and more knowledge-based and is resilient across multiple dimensions

to acknowledge the significant role of cities and local governments; the importance of the provision of basic services and public goods; and the need to enlarge the fiscal space and capacity of cities and local governments through the devolution of public administration.

In Cities and Pandemics, UN-Habitat advocates for a new social contract in the form of universal basic income, universal health coverage and universal housing and basic services. This proposal can be seen as part of an emerging vision for sustainable urban futures, as cities seek to build back differently and recover from the impacts of the pandemic.[100] The pandemic has crystallized the necessity of a rights-based universal social protection framework providing for the basics of health, housing and income for an urban future that is susceptible to disruptions.[101] This proposed new social contract articulates the "reciprocal obligations between individuals, households, communities and leaders"[102] on protection, provision and participation in society.[103] At its core, the new social contract expresses the common agenda of a human society in which every person has inherent dignity and rights. The provision of universal social protection in times of crisis is a litmus test of the strength of a social contract and a key pillar for safeguarding social cohesion.[104]

The calls for a new social contract are not new. They were well established before the crisis when only one out of five persons believed that the current social system worked for them.[105] The pandemic provided a watershed moment stirring up heated social and political debates on the efficacy of the current social trade-offs in the face of a more precarious future. In the reality of a weakly supported social contract under intense pressure from the pandemic, there was and continues to be a real threat to social cohesion with questions of state legitimacy growing louder.[106] As argued by UCLG, the 2030 Agenda is a new social contract to co-create a sustainable future for the planet.[107] In this regard, local governments are key players and SDG 11 targets provide a starting point for local governments and partner institutions to launch the kind of initiatives that can deliver sustainable urban futures.

The case for universal basic income

Universal basic income (UBI) provides a pathway out of extreme poverty by creating a mechanism to support economic opportunities and widen social inclusion for vulnerable groups.[108] In UBI schemes, citizens receive regular, guaranteed, broad-based, unconditional income support from the state.[109] Public support for UBI grew from the onset of the pandemic with the growing perception that precarious

economic futures will affect all one way or the other. The pandemic has moved UBI into mainstream public policy as seen by increased support across the political spectrum, including more economically conservative thinkers, that some form of targeted basic income is needed in the face of the economic hardship caused by widespread job losses.[110] This idea has already been piloted at the local level, with cities creating models that could be scaled up to the national level.[111] The possibility of technologically-enabled administration of such systems also contributes to its growing support. [112]

There has been an exponential growth in social protection programmes since the onset of COVID-19, with some form of universal income being a key component.[113] By May 2021, there were 3,333 planned or implemented social protection measures in 222 countries and territories. That growth translates to a 32-fold increase since the start of lockdowns in March 2020, when just 103 such schemes were recorded. Of these measures, 42 per cent of the interventions were cash transfers – both conditional and unconditional. There are strong indications that the measures prevented millions from falling into poverty in Latin America.[114] The US experience stands out as a strong case for the impact of a guaranteed income in addressing poverty and inequality. The 2020 stimulus check payments kept 11.7 million people from falling into poverty. In fact, the national government payments reduced poverty rates from 11.8 per cent in 2019 to 9.1 per cent in 2020.[115] This outcome has provided strong evidence to challenge the common criticism of UBI as having a drag effect on economic prosperity.

The case for universal health coverage

Universal health coverage (UHC) means that all persons have access to sufficient quality healthcare to restore and improve their health when they need it, without undue financial strain.[116] The goal of universal health coverage is threefold: equity in access whereby everyone who needs health services should get them, not only those who can pay for them; sufficient quality, which means that health services should be good enough to improve the health of those receiving services; and no undue financial risk, in that the cost of using health services should not be a deterrent to access healthcare (Chapter 7).[117]

The stark reality is that access to healthcare is far from equitable; at least half of the world's population still do not have full coverage of basic health services

The stark reality is that access to healthcare is far from equitable; at least half of the world's population still do not have full coverage of basic health services, and over 800 million people spend at least 10 per cent of their household budgets on health.[118] UHC protects vulnerable groups from falling into poverty for present and even future generations.[119] Health care for all encompasses more than access to health services. It entails preventive measures, including healthy urban design that reduces spatial inequality, improves air quality and manages urbanization in a fashion that protects biodiversity and mitigates the spread of zoonotic diseases.[120]

The case for universal housing

The value of adequate housing was proven in its use as a public health strategy for managing the pandemic.[121] As the pandemic persisted, many low-income urban residents found themselves confined in inadequate housing lacking adequate basic services and with no income, risked eviction.[122] At the height of the pandemic, many countries initiated measures to protect access to housing including moratoriums on evictions, rent subsidies and mortgage relief programmes. Measures were also taken to house the homeless. For instance, in the UK, the Everyone In scheme established in March 2020 temporarily placed 15,000 individuals at risk of lacking shelter in hotel rooms.[123] Reducing exposure to health risk by safeguarding access to housing helped the National Health Service cope with demand by flattening the curve for acute cases.[124] This outcome demonstrated the positive link between access to housing and improved health. Beyond pandemics, access to appropriately designed, inclusive and affordable housing is a useful lever for sustainably realizing the aspirations of urbanization.

The emerging vision of urban futures must also reflect the new normal, which entails new ways of living, working, studying, recreating and socializing; a renewed focus on hygiene and public health; more public spaces; and different forms of social interactions. For instance, at the city level, this shift in urban lifestyles manifests in the increasing importance of the home as a part-time or even full-time workplace for some workers; social distancing, reprioritization and retrofitting of public space (Chapter 6); and increased deployment of innovation and technology (Chapter 9) – all of which show that there are radically different ways of living.[125]

Visions of urban futures should be driven by the realities on the ground, which means embracing the new opportunities to tackle existing and emerging challenges. Positive visions of urban futures will not be realized by chance, but instead facilitated by proactive measures, inclusive policies,

meticulous planning, fit for purpose institutions and public and private sector collaboration. Achieving these visions involves prioritization of actions, selection of strategic interventions, efficient monitoring systems and control of negative forces.

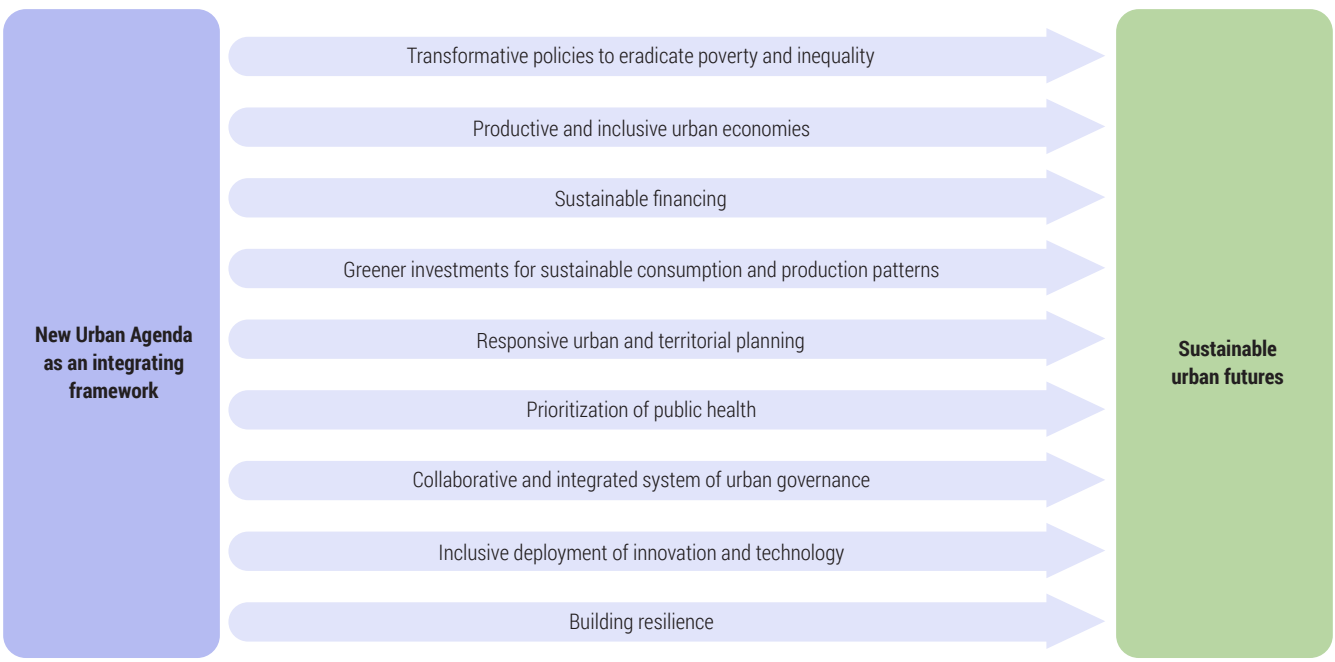
Realizing the urban visions that we want is predicated on addressing the inherent weaknesses of the current models of urbanization and building back differently with emphasis on inclusive policies

Realizing the urban visions that we want is predicated on addressing the inherent weaknesses of the current models of urbanization and building back differently with emphasis on inclusive policies. How do we create economically productive cities without exacerbating inequality? How do we rethink models of city development that are largely driven by private, rather than public, interests? How can the model of city development avoid generating multiple forms of deprivation, social exclusion and digital divides, which ultimately create spatial inequalities and divided cities? How can the model of urbanization be part of the solution to climate change and environmental degradation rather than the cause? The answers to these and many more questions are key to achieving visions of sustainable urban futures.

1.6 Pathways to Sustainable Urban Futures

Urbanization in the twenty-first century is not a singular pathway, but rather encompasses divergent paths to growth and many possible futures, including multiple threats. Despite the range of possibilities, it is important to consider desirable outcomes that make cities more equitable, inclusive, productive, green, compact, walkable and healthy as called for by the relevant components of the global development agenda. The interrelated and mutually reinforcing pathways to sustainable urban futures will be determined by inclusive and transformative policies to eradicate poverty and inequality; produce urban economies that provide opportunities for all; generate greener investment and sustainable consumption and production patterns; set the framework for responsive urban and territorial planning; implement collaborative and integrated systems of urban governance; prioritize public health; deploy inclusive innovation and technology; and build resilience, which enables cities to respond to and withstand a wide range of shocks (Figure 1.4). The effective implementation of the New Urban Agenda serves as an integrating framework for the various interrelated components that constitute these pathways.

Figure 1.4: Pathways to sustainable urban futures



1.6.1. Transformative policies to eradicate poverty and inequality

We cannot envision a bright future for cities when inequality appears to be on the rise globally and poverty is endemic in certain regions (Chapter 3). Without concerted action at all levels, poverty and inequality might be the defining features of the future of cities. Indeed, it has been noted that poverty and inequality could be greater in the post-pandemic era if governments do not take decisive actions.[126] Inequality in urban areas is undermining the social value of urbanization. A more proactive approach is therefore required to deal with urban inequality and to take advantage of the economic and social opportunities offered by urbanization.[127] Social protection programmes and redistributive polices are urgently needed and should be mainstreamed in domestic resource frameworks as it is a necessary investment in people, not a burden.[128] Social protection programmes serve to counter market forces by giving priority to vulnerable and low-income households.

Urban futures will only be equitable for all when the rights of vulnerable groups are protected; gender equality is promoted

Urban futures will only be equitable for all when the rights of vulnerable groups are protected; gender equality is promoted; there is broad-based civic participation; persons are protected against discrimination based on sexual orientation and gender identity; and when marginalized groups like slum dwellers, the homeless, indigenous people, youth, and older persons are empowered. These issues are explored in greater detail in Chapter 3, which also discusses how cities can respond to the challenges of poverty and inequality to ensure that no one is left behind, especially in midst of the multiple crises.

1.6.2 Productive and inclusive urban economies

The urban economy is integral to the future of cities. Given the contribution of the urban economy, the future of many countries will be determined by the productivity of its urban areas. Policies designed to ensure access to productive employment, nurture the talent and skills required to thrive in a modern urban economy, develop endogenous resources, effectively manage urban growth diseconomies, and identify the impediments that prevent cities from maximizing their productivity potential all have a key role to play in building resilient urban economies.[129] The crises precipitated by the pandemic should be an

Greater economic diversity improves productivity by utilizing existing and potential resources as a basis for building up resilience

opportunity for cities to adopt innovative ways of driving their economies.

Policies should address how cities can diversify their economy to create jobs, enhance access to goods and services, and reduce poverty and inequality. A lack of economic diversity increases the vulnerability and scale of economic decline.[130] By contrast, greater economic diversity improves productivity by utilizing existing and potential resources as a basis for building up resilience against shocks.[131]

Sustainable urban futures are contingent on viable sources of finance. It is important to address how urban futures can be adequately financed in the face of dwindling local government revenues, huge budget deficits and decreasing foreign investment, among other fiscal constraints. The path to long-term sustainable financing in cities requires diversification and mobilization from a wide range of financial resources. Existing urban fiscal systems must be overhauled to ensure locally viable tax revenues. In turn, cities must have access to the financial resources required to meet their needs since they are ideally placed to drive local redistribution programmes and provide social safety nets.[132] Chapter 4 explores how urban economies can be strengthened and discusses the path to a resilient economic future for cities.

1.6.3 Green investments for sustainable consumption and production patterns

Green investments offer an essential pathway for the future of cities. Lessons from the COVID-19 pandemic show that a green economic recovery can yield significant environmental benefits. Countries and cities can deliver greener urban futures by investing in cleaner and more resilient forms of renewable energy that will create lasting solutions, reduce the risks of future crises and adequately mitigate the impacts of climate change. Cities can transition to sustainable urban futures characterized by net zero GHG emissions and much reduced impacts on the environment. This transition to carbon neutrality must be accompanied by significant shifts to sustainable consumption and production patterns that contribute to the responsible use of resources (Chapter 5). Policies and planning processes that integrate cities into the ecosystems

of subnational regions foster resilience and can contribute to the transition toward a circular economy.[133]

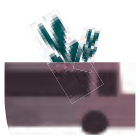
The pathway to sustainable urban futures requires delivering environmental benefits in a manner that reaches every segment of the population, especially the disadvantaged. The urban poor must be represented, and their needs prioritized, be it about the urban commons, atmospheric commons, public spaces or resource use. In urban areas, nature-based solutions have been associated with positive effects on both urban biodiversity and human health. Investments in ecosystem services and natural infrastructure are not only a cost effective and sustainable way to improve resilience to climate impacts, but also offer employment opportunities like human-made infrastructure investments.[134] A recent study shows that ecosystem restoration creates 3.7 times as many jobs as oil and gas production per dollar.[135]

1.6.4 Responsive urban and territorial planning

The pandemic exposed the weaknesses of current urban planning in many contexts. This inadequacy is evident from the fragmented response at various levels of governance and across jurisdictional boundaries. Weaknesses of urban planning systems in effectively addressing such crises also reflect failings in governance structures, which underscores the need for urban planning to continuously adjust to the new realities and forces refashioning the global context so that we do not continue along dysfunctional trajectories.[136]

The pathway to better urban futures calls for planning paradigms that are responsive to changes in urban realities – these can play a vital role in addressing multiple and evolving challenges. This kind of urban and territorial planning will improve preparedness and empower cities to adequately respond to all hazards, including public health threats and future systemic shocks.

As a pathway to sustainable urban futures, urban planning can create sustainable neighbourhoods drawing on lessons from the COVID-19 pandemic. There is renewed focus on compact, mixed-use neighbourhoods and the use of non-motorized transport such as cycling and walking. During this period the "15-minute city" emerged as an important concept in making cities more sustainable.[137] The 15-minute city aims to ensure that everything urban dwellers need in their day-to-day endeavours can be reached within 15 minutes by foot, bicycle or public transit. This method of living can help cities rebuild and restore their economy while protecting lives and cutting dangerous pollution.[138] Fundamentally, such proposals require improvements in the quality and density of public transport links between neighbourhoods and to poorly-connected neighbourhoods (urban "weak spots"), among other measures.[139] Public transport remains integral to achieving cleaner and greener urban futures despite perceptions, now waning, that it is a major gateway for the spread of diseases.[140] This fundamental urban reality means that public transport systems should be made accessible, safe, affordable, efficient and reliable, as well as able to serve diverse demands (Chapter 6).



This transition to carbon neutrality must be accompanied by significant shifts to sustainable consumption and production patterns

1.6.5 Prioritization of public health

Public health should be prioritized as a key component of the urban development framework. The pandemic laid bare the weakness of the health systems in many countries. Cities in collaboration with national governments and relevant stakeholders, including the private sector, must invest in health infrastructure as an integral part of city resilience development programmes. Chapter 7 addresses how cities in both developed and developing countries can prioritize public health given its importance to sustainable urban futures.

Public health should be prioritized as a key component of the urban development framework

Health and health disparities must be addressed within a broader societal context, including the quality of the built environment, which plays a key role in health outcomes.[141] Given that cities are places where health disparities vary across social groups and neighbourhoods, appropriate urban healthcare must be provided for vulnerable groups – children, women, the poor, ethnic minorities, migrants, the elderly, the homeless and other excluded groups who tend to be disproportionately affected.

Allocation of adequate resources should be made to facilitate the development of twenty-first century health systems, including preparedness and responses that can match and support the demand for future urban healthcare. Rapid urbanization means that an increasing number of people are exposed to risk factors emanating from the social and physical environment, which contributes to increased stress and worse mental health outcomes.[142]

Public Health Technical Officers collecting samples for COVID-19 tests at Nawong Temple Market, Donmuang, Thailand © Shutterstock

1.6.6 Collaborative and integrated systems of urban governance

Lessons from the COVID-19 pandemic demonstrate the inherent weakness of urban governance frameworks in addressing complex global emergencies. The fragmented response at various levels calls for strong, effective and inclusive institutions as well as a more integrated, cooperative multilevel governance approach. Multilevel governance arrangements are instrumental for creating synergies, reducing overlapping and critical gaps between institutions, and promoting trust and accountability that enhance policy coherence.[143] Multilevel urban governance strategies have been lauded as an effective mechanism by which cities can respond to a wide range of shocks in several contexts.[144] Chapter 8 discusses how urban governance and institutional structures can drive sustainable urban futures and analyzes some of the governance mechanisms that have been adopted at various scales.

The governance structures required for a resilient urban future must be fit for purpose to address twenty-first century urban challenges. COVID-19 has reinforced an important lesson: no single city, irrespective of its resources, can address the pandemic alone. Rather, cities working with smaller units and higher levels of government were able to respond better to the pandemic. Effective localization of the global agendas and the realization of the economic, social, environmental, health, infrastructural and institutional imperatives underlying sustainable urban futures hinges on multilevel governance arrangements. The localization and implementation of the global agendas with local governments being in the driving seat is central to achieving sustainable urban futures.

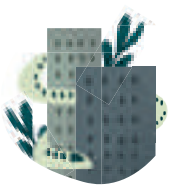
Multilevel urban governance strategies have been lauded as an effective mechanism by which cities can respond to a wide range of shocks in several contexts

1.6.7 Inclusive deployment of innovation and technology

The future of cities will be knowledge-based, driven largely by innovation and the widespread use of new technologies and digitization of virtually all facets of urban living. The value of innovation and technology lie in the transition to more sustainable urban futures – more productive, prosperous and resilient urban economies; enhanced social inclusion and equitable policymaking; and environmentally resilient urban development.

In serving as a pathway to sustainable urban futures, it is important that the deployment of innovation and technology is linked to the uniqueness of local urban conditions and trends, including resource availability. What kind of technology can be deployed in different urban contexts in view of the large disparities that exist in the availability and usage of technology solutions? Developments in science and technology will have a major impact on society, but there are uncertainties in the city dimension of these developments (Chapter 9).

While the deployment of innovation and technology has responded to urban challenges in various contexts, it has exposed a deepening digital divide and social inequalities. Since "the future of technology is the future of cities,"[145] it is imperative to address digital exclusion to ensure that the digital revolution in cities is inclusive and leaves no one behind. Some cities are already making strategic investments to ensure that minority groups are not digitally excluded. In 2020, the Toronto District School Board distributed 60,000 devices to its students during the transition to remote learning to ensure that no child is left behind in the learning process.[146]



The future of cities will be knowledge-based, driven largely by innovation and the widespread use of new technologies and digitization of virtually all facets of urban living

Putting people at the centre calls for concerted efforts by cities to close the digital divide within cities and across the urban-rural continuum, as well as within various population groups; empower people by building their digital skills; support job creation in the digital sector; use digital platforms to deliver services equitably; protect the most vulnerable online; mobilize new financing models to reach the unconnected; and invest in affordable technology solutions.[147]

building resilience is a multisectoral, multidimensional and multi-stakeholder effort, which requires effective collaboration and cooperation across all scales

1.6.8 Building resilience

A central premise of this Report is that building economic, social and environmental resilience, including appropriate governance and institutional structures, must be at the heart of the future of cities. The discussion in the preceding sections feed into the notion of resilience. For instance, measures designed to diversify urban economies to enhance economic resilience should be aligned with the long-term objectives of achieving net zero GHG emissions. As a pathway to sustainable urban futures, building resilience is a multisectoral, multidimensional and multi-stakeholder effort, which requires effective collaboration and cooperation across all scales, as the various dimensions of resilience are interrelated and mutually reinforcing. In practice, well-designed resilience policies can cover these dimensions simultaneously.[148]

The notion of resilience should go beyond one that seems to favour simply enduring the status quo without attempting to change the underlying conditions that created such adverse situation in the first place. The idea of challenging resilience is to go beyond building back better to building differently in a manner that does not preserve the existing situation, but rather effects a real change that confronts structural inequalities in an uneven society. Chapter 10 identifies the necessary supportive structure and capacity required to build resilient urban futures in different contexts, including the specific roles of the different levels of government and relevant stakeholders.

The idea of challenging resilience is to go beyond building back better to instead building differently in a manner that does not preserve the existing situation

1.7 Concluding Remarks

World Cities Report 2022: Envisaging the Future of Cities seeks to provide greater clarity and insights into the future of cities based on existing trends, challenges and opportunities, as well as disruptive conditions, including the valuable experience and lessons from the COVID-19 pandemic, and suggest ways that cities can be better prepared to address a wide range of shocks and transition to sustainable urban futures. The Report proposes a state of informed preparedness that provides us with the opportunity to anticipate change, correct the course of action and become more knowledgeable of the different scenarios or possibilities that the future of cities offers. The future certainly matters. As the Organization for Economic Cooperation and Development argues: "It illuminates the ways that policy, strategies and actions can promote desirable futures and help prevent those that we consider undesirable."[149]

This Report builds on two major reports recently published by UN-Habitat: *World Cities Report 2020: The Value of Sustainable Urbanization* and *Cities and Pandemics: Towards a More Just, Green and Healthy Future*. The former convincingly affirms that well-planned, managed, and financed cities and towns create value that can be harnessed for sustainable urban futures and make cities and human settlements more resilient in the face of profound shocks and risky events. The latter provides the basis for much-needed local level action on spatial planning, poverty and inequality, the economy and governance in addressing the impacts of the COVID-19 pandemic as cities seek to build back differently.

This Report seeks to imagine a future of cities that connect to the structural problems and conditions that predate the pandemic. These are hard realities – including the destructive effects of climate change, inequality, poverty and various forms of marginalization and exclusion – and if not adequately addressed, they will continue to shape our urbanizing world. This Report does not seek to predict the future; rather, it assesses the possibility of alternative futures. Although the future cannot be known with absolute certainty, a wide range of futures is possible. Exploratory predictive analysis can provide insights into the future to ensure rational thinking that can manage uncertainty.

The Report conceptualizes the possible futures for cities in terms of desirable outcomes in which people experience a good quality of life, the global and local commons are respected, rights are guaranteed, collective interests are protected, and a world of equality with differences is tolerated. At the same time, the Report explores negative scenarios that limit the transition to sustainable urban futures. The Report discusses the necessary conditions for the manifestation of brighter urban futures while understanding that urban futures and the paths toward them are neither linear nor independent, but instead are merged and interwoven into multiple realities, all of which are necessary to understand and ensure a better future for all.

Endnotes

1. Moir et al, 2014.
2. UN-Habitat, 2020a.
3. Glaeser and Cutler, 2021.
4. United Nations, 2020a; UN-Habitat, 2021a; Deloitte, 2021; OECD, 2020a.
5. United Nations, 2020a.
6. Deininger et al, 2019.
7. UN-Habitat, 2020a.
8. Sachs et al, 2019.
9. Sachs et al, 2019.
10. UNDESA, 2014a.
11. UNDESA, 2019a.
12. McGowan, 2020.
13. Scripps Institution of Oceanography, 2022.
14. IPCC, 2021.
15. IEA, 2021a.
16. SEI et al, 2021.
17. SEI et al, 2021.
18. World Bank, 2020a.
19. UNDESA, 2020b.
20. UNDESA, 2014a.
21. IMF, 2021.
22. UN-Habitat, 2021a.
23. Cities Alliance, 2021a.
24. United States Census Bureau, 2022.
25. Florida et al, 2020.
26. WHO, 2021a.
27. WHO, 2021a.
28. Puttkamer, 2020.
29. UN-Habitat, 2016a.
30. UN-Habitat, 2016a.
31. Zakaria, 2020.
32. Ghebreyesus and von der Leyen, 2020.
33. UN-Habitat, 2016a.
34. Acuto et al, 2020.
35. UN-Habitat, 2009a.
36. McKinsey and Company, 2018.
37. UN-Habitat, 2016a.
38. UN-Habitat, 2008.
39. IOM, 2019.
40. IMO, 2019.
41. UN-Habitat, 2009.
42. UN-Habitat, 2016a.
43. McGowan, 2020.
44. Bach, 2020.
45. UN-Habitat, 2020a.
46. IPCC, 2019.
47. Fu et al, 2016.
48. United Nations, 2017.
49. UN-Habitat, 2020a.
50. Moir et al, 2014.
51. UCLG, 2019.
52. UN Habitat, 2020a.
53. UN Habitat, 2020a.
54. Woetzel et al, 2017.
55. Woetzel, et al, 2017.
56. UN Habitat, 2020a.
57. Transport for London, 2021.
58. Florida, 2019.
59. Walling et al, 2021.
60. OECD and European Commission, 2020.
61. Eurostat, 2021.
62. Eurostat, 2021.
63. UN-Habitat, 2009.
64. Moir et al, 2014.
65. Moir et al, 2014, p.18.
66. UNDESA, 2018.
67. UN-Habitat, 2021.
68. Freire et al, 2014.
69. Mahendra et al, 2021.
70. UNDESA, 2020a.
71. UN-Habitat, 2020a.
72. Baker, 2008.
73. Sachs et al, 2021.
74. Furceri et al, 2020.
75. Sumner et al, 2020.
76. UN-Habitat, 2020a.
77. UN-Habitat, 2016a.
78. WHO and UNICEF, 2021.
79. UN-Habitat, 2020a.
80. UN-Habitat, 2020a.
81. UN-Habitat, 2020a.
82. Global Commission on Adaptation, 2019.
83. UNDESA, 2015.
84. Urdal, 2004.
85. UNDESA, 2019b.
86. Cities Alliance, 2021a.
87. Broom, 2020.
88. Hughes et al, 2021.
89. UN-Habitat, 2020.
90. Chen, 2020.
91. World Data Lab, 2022.
92. UN-Habitat, 2020a.
93. Gourinchas, 2022.
94. Hughes et al, 2021.
95. UN-Habitat, 2021a.
96. Valencia et al, 2019.
97. Parnell, 2016.; Cohen and Habron, 2018; Valencia et al, 2019.
98. UN-Habitat, 2021a.
99. UN-Habitat, 2018a.
100. UN-Habitat, 2021a.
101. Devereux, 2021; Büscher et al, 2021; Razavi et al, 2020.
102. United Nations, 2021d.
103. Loewe et al, 2021.
104. ILO, 2021.
105. Edelman, 2019.
106. Razavi et al, 2020 Editorial (2020); Auethavornpipat and Tanyag, 2021.
107. UCLG, 2019.
108. Wijngaarde et al, 2021.
109. Francese and Prady, 2018.
110. McGowan, 2020.
111. Gentilini et al, 2020; Hughes, 2018.
112. Nettle et al, 2021.
113. Gentilini et al, 2020.
114. Lustig et al, 2020.
115. United States Census Bureau, 2021.
116. WHO, 2021a.
117. United Nations, 2020b.
118. United Nations, 2020b.
119. WHO, 2021b.
120. UN-Habitat, 2021a.
121. United Nations, 2021a.
122. Devereux and Cuesta, 2021.
123. Bradshaw et al, 2021.
124. Bradshaw et. al, 2021.
125. Florida et al, 2020.
126. Stiglitz, 2020.
127. UN-Habitat, 2020a.
128. United Nations, 2021a.
129. UN-Habitat, 2020a.
130. Sharifi and Khavarian-Garmsir, 2020a.
131. OECD, 2020a.
132. Parnell, 2020.
133. UN-Habitat, 2021.
134. OECD (2020a.
135. WRI et al, 2021.
136. UN-Habitat, 2018a.
137. Hadjiosif, 2020.
138. Sisson, 2020a.
139. C40 Knowledge Hub, 2021.
140. Sharifi and Khavarian-Garmsir, 2020b; Eltarabily and Elghezanwy, 2020.
141. Joint Research Centre, 2019.; Fouad et al, 2017.
142. Gruebner et al, 2017.
143. UN-Habitat, 2020a.
144. Sharifi and Khavarian-Garmsir, 2020a.
145. Cornell Tech, 2021.
146. CBC, 2020.
147. United Nations, 2021d.
148. OECD, 2020a.
149. OECD, 2017.

Chapter 2:

Scenarios of Urban Futures: Degree of Urbanization

Quick facts

1. Global city population share doubled from 25 per cent in 1950 to about 50 per cent in 2020; it is projected to slowly increase to 58 per cent over the next 50 years.

2. Between 2020 and 2070, the number of cities in low-income countries will increase by 76 per cent, in high-income and lower-middle-income countries by about 20 per cent, and in upper-middle-income countries by 6 per cent.

3. Over the next five decades, growth in city land area will mostly take place in low-income (141 per cent), lower-middle-income (44 per cent) and high-income countries (34 per cent). Changes in upper-middle-income countries are projected to be relatively small (13 per cent).

4. Small cities cover almost half of city land (about 45 per cent) in low-income countries, a trend that will persist over the coming decades.

Policy points

1. City densities in low-income countries need to be planned for and managed in ways that future growth does not exert pressure on existing open land, infrastructure and services, and result in crowding on the one hand or lead to unsustainable sprawl on the other.

2. Enhanced planning capacities for small cities and emerging newer cities will strengthen the important role they play across the urban-rural continuum in achieving sustainable futures.

3. Planning for age-friendly cities and towns that afford good quality of life for all inhabitants across all generations is critical for sustainable futures.

4. Effective urban and territorial planning is critical to mitigate the negative social, economic and environmental associated with future urban growth.

5. Effective urban and territorial planning is critical to mitigate the negative social, economic and environmental associated with future urban growth.

One of the fundamental challenges linked to monitoring global urbanization trends and progress on the global development agendas has been the lack of a unified definition as to what constitutes "urban" and its precise measurement that can facilitate international comparability. This has largely been attributed to the differing criteria employed by countries in defining "urban" and "rural" areas—a reflection of their various perspectives as to what constitutes these types of human settlements. Understanding future scenarios of urban trends calls for a more precise measurement that allows for meaningful comparison across countries, while remaining relevant to national conceptions of urban and rural areas.

It is in this light that this chapter uses a new, harmonized and global definition of urbanization that facilitates international comparability to present scenarios of urban trends in various regions of the world. These scenarios allow us to understand the anticipated demographic and spatial changes across the urban-rural continuum in various regions as well as their drivers. This definition, known as the Degree of Urbanization, was endorsed by the United Nations Statistical Commission in 2020. It was developed by six international organizations[1] to facilitate international comparisons and complement national definitions. The monitoring of both the New Urban Agenda and the 2030 Agenda for Sustainable Development in particular stands to benefit from this harmonized definition. A detailed manual of how to apply this new definition was published in 2021.[2]

Chapter 1 describes urban trends based mainly on data from the United Nations World Urbanization Prospects (WUP). This chapter, on the other hand, complements the analysis in the preceding chapter by providing a different, but equally important, perspective on future trends using Degree of Urbanization and data emanating from this new harmonized approach.

The chapter begins with a short introduction to the Degree of Urbanization. It then shows how urbanization has and will change from 1950 to 2070 using a new global definition of cities, towns and rural areas. The chapter presents the drivers of urbanization in the different regions of the world, highlighting how the spatial expansion of cities and the emergence of new cities have contributed to city population growth. It reveals how cities attract young adults, but children and elderly are more likely to live outside cities. The chapter explores how the number and size of cities have been changing and the future challenges of city growth. Finally, the chapter interrogates how dense our cities should be while advancing options that enhance sustainability.

2.1. The Degree of Urbanization and Why it is Important?

Despite varying national definitions, the harmonized definition proposed by the Degree of Urbanization methodology has revealed that there is in fact a broad consensus across countries on what constitutes a large city and where the most rural areas are. However, there is a wide variation in how "towns" are defined, a discrepancy with profound implications for demographic analysis of global urbanization trends. In general, national definitions in Europe and the Americas tend to classify towns as urban, while in Africa and Asia they tend to classify them as rural. For example, in Brazil, France, Mexico and the United States, towns tend to be classified as urban, while in Egypt, India, Uganda and Viet Nam towns are often classified as rural. In some cases, this happens because the country uses a high minimum population threshold for a settlement to be considered urban. In other cases, especially where the minimum population threshold is already met, a range of other indicators or criteria applied by a country (in combination with the minimum population threshold) excludes such settlements from being officially recognized as urban. This distinction leads to only a small share of towns being classified as urban.

There is a wide variation in how "towns" are defined, a discrepancy with profound implications for demographic analysis of global urbanization trends

It is worth noting that most national definitions with a minimum population size threshold for an urban area use a relatively low threshold. Out of the 100 countries for which the World Urbanization Prospects lists a minimum population threshold, 84 use a threshold of 5,000 or smaller. The Degree of Urbanization follows this approach and defines all settlements with at least 5,000 inhabitants as urban. However, it recommends splitting these urban areas into cities of at least 50,000 inhabitants, on the one hand, and towns and semi-dense areas, on the other hand. This captures the urban-rural continuum more accurately, as a growing number of national definitions do as well. It also means that the cities and the rural areas as defined by the Degree of Urbanization are generally classified as urban and rural, respectively, by their national definitions and that the areas that are not treated consistently by national definitions are confined to the intermediate classes: "towns and semi-dense areas."

To better understand urban futures and their demographic drivers, it is important move beyond the classical rural-urban dichotomy and consider entire urban continuum

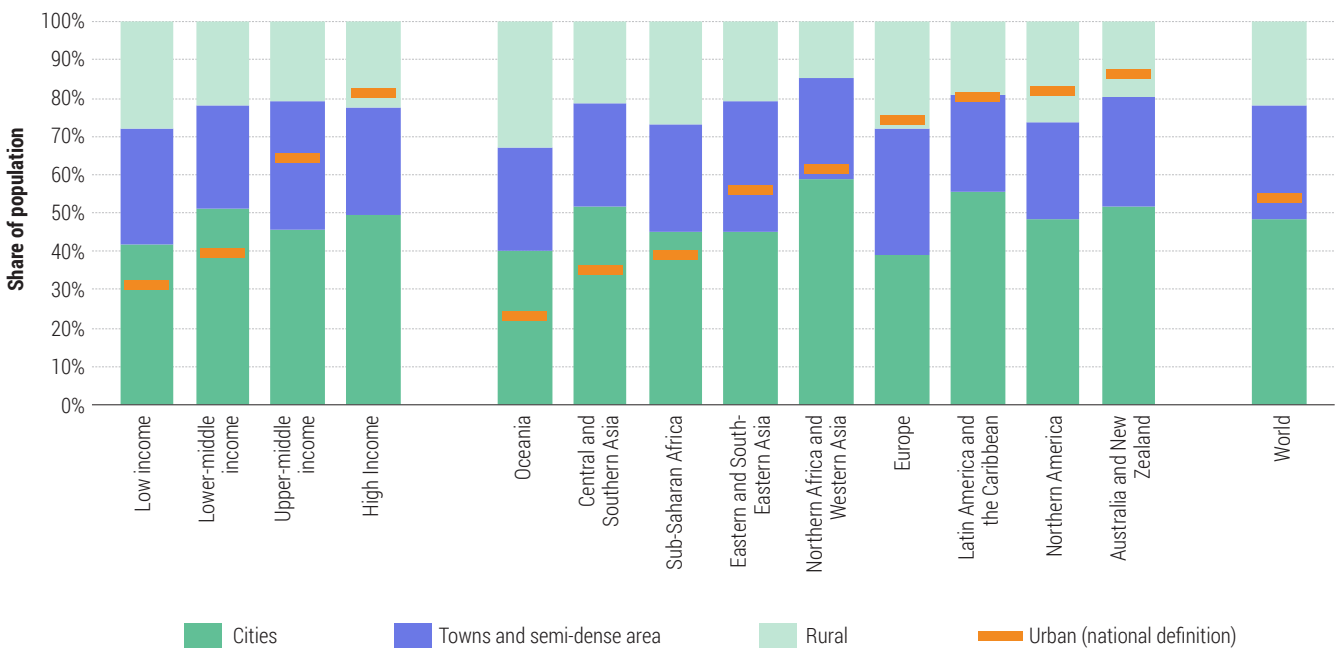
The Degree of Urbanization also has a second-level classification that splits towns from semi-dense areas and creates three classes in rural areas: villages, dispersed rural and mostly uninhabited (Box 2.1). To better understand urban futures and their demographic drivers, it is important move beyond the classical rural-urban dichotomy and consider entire urban continuum.[3] This reconceptualization is critical and aligns with the vision of the New Urban Agenda and SDG 11 of fostering equitable regional development across all sizes and scales of human settlements while supporting positive economic, social and environmental interlinkages in these territories. Sustainable urban futures cannot be realized using the traditional dichotomized or binary treatment of human settlements.

The discrepancy in how towns and other areas in the middle of the urban-rural continuum are classified by national definitions has a statistically significant impact on the global level of urbanization. For example, the world would be substantially "more urban" if all such settlements were classified as urban. Applying this definition to an estimated global human settlements population grid (GHS-POP)[4] for 2015 shows that in most regions the population share in cities as defined by the Degree of Urbanization is similar or smaller than the urban population share based on national definitions (Figure 2.1).

The rural population share as defined by the Degree of Urbanization is also typically similar or smaller than the national defined rural population share. In high-income countries, however, the nationally-defined rural population share is smaller than the one as defined by the Degree of Urbanization approach. This is because several of the high-income countries use a minimum population threshold below 5,000 inhabitants. For example, the US uses 2,500, Canada and New Zealand use 1,000 and Denmark and Sweden use 200.

These results highlight the broad agreement on the two categories of human settlement at the extremes as well as the disagreement with regard to the middle of the urban-rural continuum. Given the global population concentration in Asia and Africa, the global population share in nationally-defined urban areas (54 per cent) has a closer resemblance to the share of population in cities (48 per cent) than the aggregate of cities plus towns and semi-dense areas (78 per cent) as defined by the Degree of Urbanization.

Figure 2.1: Population by Degree of Urbanization and in nationally defined urban areas by SDG regions and income group, 2015



Box 2.1: Levels and classes in the Degree of Urbanization methodology

The Degree of Urbanization methodology offers more nuance than the "urban" and "rural" binary that categorizes the demographic classification of human settlements common in many national statistical offices. Instead of those two categories, the Degree of Urbanization approach proposes two levels of understanding with distinct classes of human settlement by analysing grid cells of one square kilometre (1 sq. km).

Level 1 consists of three classes:

1. **Cities**: settlements of at least 50,000 inhabitants in a high-density cluster of grid cells (greater than 1,500 inhabitants per sq. km)
2. **Towns and semi-dense areas**: an urban cluster with at least 5,000 inhabitants in contiguous moderate-density grid cells (at least 300 inhabitants per sq. km) outside cities
3. **Rural areas**: grid cells with a density of less than 300 inhabitants per sq. km or higher density cells that do not belong to a city, town or semi-dense area

Urban areas are defined as "cities" plus "towns and semi-dense areas." It is recommended, however, to keep all three classes separate given their different nature.

Level 2 uses six classes:

1. **Cities**: same as above
2. **Towns**: settlements with between 5,000 and 50,000 that are either dense (with a density of at least 1,500 inhabitants per sq. km) or semi-dense (a density at least 300 inhabitants per sq. km).
3. **Suburban or peri-urban areas:** cells belonging to urban clusters but not part of a town
4. **Villages**: settlements with a population between 500 and 5,000 inhabitants and a density of at least 300 inhabitants per sq. km.
5. **Dispersed rural areas**: rural grid cells with a density between 50 and 300 inhabitants per sq. km.
6. **Very dispersed rural areas or mostly uninhabited areas**: rural grid cells with a density between 0 and 50 inhabitants per sq. km.

The World Urbanization Prospects also lists cities with at least 300,000 inhabitants. Comparing these designations with the cities identified by the Degree of Urbanization shows a very high overlap.[5] This confirms that national definitions and the Degree of Urbanization agree on what constitutes a large city. However, compared to the data in the World Urbanization Prospects, the data used here has several advantages (Box 2.2). The concept of "city" and its definition here have been harmonized whereas the World Urbanization Prospects employs a mixture of city proper, urban agglomeration and metropolitan areas. Second, instead of the point locations provided by the World Urbanization Prospects, this data set produces boundaries with a high spatial resolution. The cities are defined using a grid of one square kilometre (1 sq. km) cells. This means that city population densities can be calculated and compared in a meaningful way.

The cities are defined using a grid of one square kilometre (1 sq. km) cells. This means that city population densities can be calculated and compared in a meaningful way

Box 2.2: Advantages of the Degree of Urbanization methodology: A summary

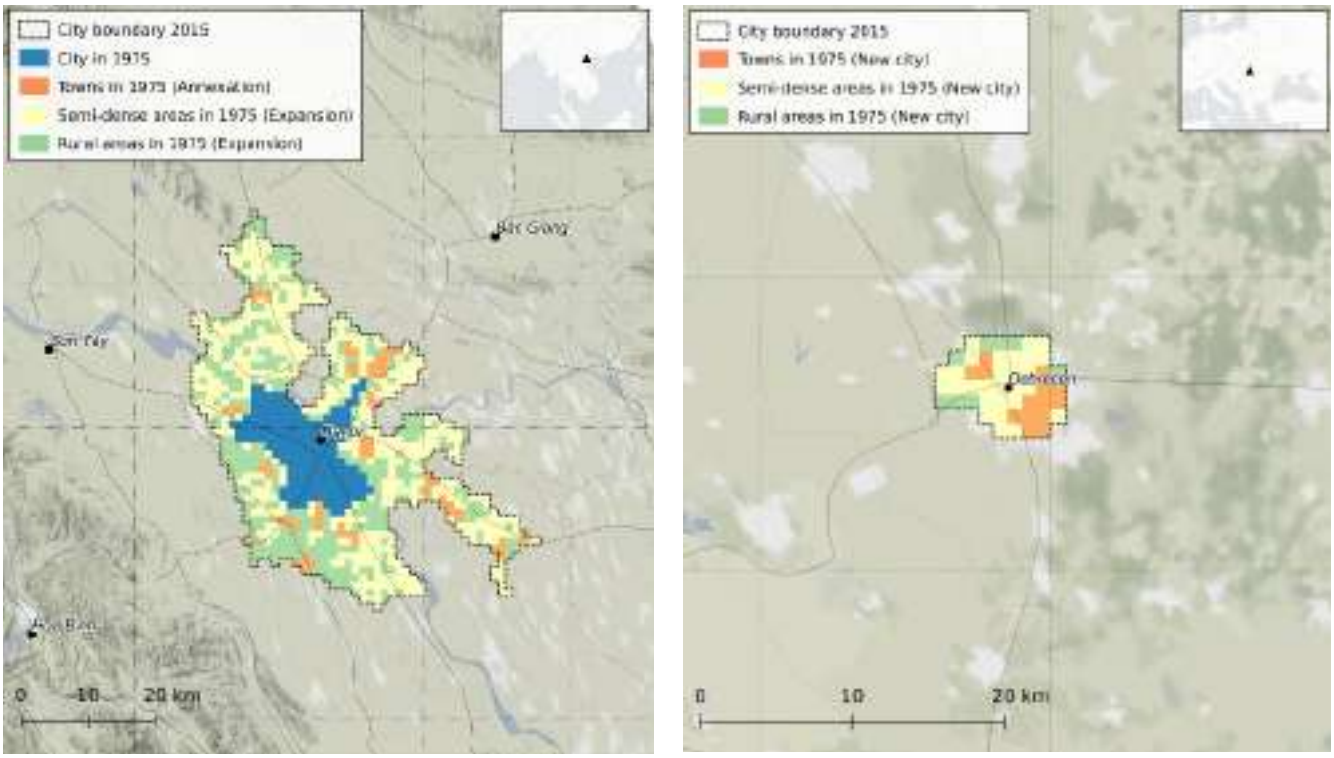
The Degree of Urbanization methodology:

- captures the urban-rural continuum through three different classes at level 1 and through six different classes at level 2 of the methodology's classification system (Box 2.1: Levels and classes in the Degree of Urbanization methodology);
- uses the same population size and density thresholds across the world;
- starts from a population grid to reduce the bias of using spatial units with different shapes and sizes;
- measures population clusters directly instead of indirectly by using building clusters as an approximation of population clusters;
- defines areas independently from their access to services to ensure that this access can be monitored reliably, in other words, without interference from the definition;
- proposes a relatively cost-effective approach that can be applied to existing data collections.

Source: European Union et al, 2021.

Aerial view of Barcelona, Spain © Shutterstock

Figure 2.2: City population growth through expansion, annexation and new cities in Hanoi, Viet Nam and Debrecen, Hungary



Source: Adapted from UNDESA, 2001.

As a city expands, it incorporates the population of the surrounding rural and semi-dense areas and can annex nearby towns (Figure 2.2a). When a town grows, it can pass the minimum population threshold and become a new city (Figure 2.2b). In both cases, the total population has grown, but the initial population of the rural and semi-dense areas as well as the towns are merely reclassified. This population was already there before the city expanded or became a new city. Measuring the impact of reclassification separately is a longstanding United Nations recommendation.[6] Previously, this task has been difficult to achieve due to the lack of a harmonized definition and boundaries with a high spatial resolution. This chapter, however, looks at the impact of reclassification in subsequent sections.

Generally, the high growth rates of urban population in the World Urbanization Prospects have dominated the debates on urbanization in recent decades. However, the differences between the national definitions and the unclear impact of the reclassification of areas have led to an overestimation of urban growth rates, an emphasis on challenges for megacities relative to small- and medium-sized cities, and an underestimation of the relevance of urban natural increase versus rural-to-urban migration as a source of city population growth.[7]

According to different scenarios, in particular regarding the decline of fertility rates in developing countries, the peak for global population growth could be reached between 2070 and the end of the 21st century.[8] Apart from differences in timing, the completion of demographic transition in developing countries is expected to parallel urban transitions and lead to a convergence of urban population growth rates towards the low level already reached by highly urbanized countries.[9]

Within this general theoretical framework, the trends of urbanization in developing countries and emerging economies exhibit unique features with respect to what happened during industrialization in the 19th century. While increases in the share of urban population are only slightly higher by historical standards, developing countries are characterized by an unprecedented growth of urban population in absolute terms mostly due to their high national population growth.[10]

In terms of economic development, the previous two editions of the World Cities Report have highlighted the positive link between urban areas and economic development. The World Cities Report 2016 showcased urbanization as a transformative trend, with urban areas described as "a positive and potent force for addressing

sustainable economic growth, development and prosperity, and for driving innovation, consumption and investment in both developed and developing countries."[11] The World Cities Report 2020 reinforced this message by stating that urban areas generate enormous economic value, although the economic value generated varies depending on the local context.[12] For instance, while the linkages between urbanization and economic growth have been apparent in Eastern and South-Eastern Asia, several authors have highlighted that the relationship between urbanization and economic development has decoupled in Sub-Saharan Africa, citing several reasons e.g. widespread neglect and bad management of cities, among other factors.[13]

In relation to environmental sustainability, the World Cities Report 2020 notes that urbanization, if unplanned or unmanaged, presents threats such as "unbridled urban sprawl, irreversible land-use changes and biodiversity loss, resource and energy-intensive consumption patterns, and high levels of pollution and carbon emissions." In the same vein, Chapter 5 of this Report stresses the threat posed by the twin crises of climate change and the loss of global biodiversity to the future of cities. In relation to climate change, for instance, the IPCC points out that the resulting sea-level rise—which is expected to significantly increase by the end of this century—poses risks to high-density coastal urban developments in both developing and developed countries.[14]

Metro Manila, Philippines © Shutterstock

Box 2.3: Projections and data sources for the Degree of Urbanization methodology

The projections presented in this chapter produce different estimates of urban and rural population as compared to national definitions for two main reasons. First, some national definitions include medium-sized settlements or towns in the urban category, while others categorize them as rural. The Degree of Urbanization classifies these settlements into its own category: "towns and semi-dense areas." The second reason is that the projections of population by Degree of Urbanization are not derived from an extrapolation of the trends of rural and urban population aggregated at the national level, as normally done in the United Nations *World Urbanization Prospects*,[15] but from a bottom-up approach starting at the grid cell level.

With the Degree of Urbanization approach, urbanization is not predetermined from national trends but emerges from a gravity model that reflects the surrounding and attractiveness of each grid cell. The parameters used in this model have been estimated for different regions of the world and are based on changes in population and built-up area grids between 1975 and 2015.

Since the population by Degree of Urbanization is based on geographically-detailed data, it is possible to do a more detailed analysis. The Degree of Urbanization can be applied at multiple points in time, which makes it possible, for example, to measure the impact of expansion and densification separately for each city.

In terms of data sources, the projections and trends in this chapter rely on three distinct data sets. For the period 1950 to 1975, the population by Degree of Urbanization has been estimated by combing data based on national definitions from the *World Urbanization Prospects* and estimates of the population by the Degree of Urbanization for 1975 produced by the European Commission's Joint Research Centre (JRC). From 1975 to 2015, the data relies global estimated population grids for 1975, 1990, 2000 and 2015 produced by the JRC. The data from 2015 to 2070 relies on projected population grids produced by Jones et al. (2020). The national population projections are derived from the Shared Socioeconomic Pathway 2: Middle of the Road scenario as prepared by the International Institute for Applied Systems Analysis (IIASA).

2.2. City Population Continues Growing as Towns and Rural Areas Experience Slowdown

Urbanization undoubtedly presents a unique opportunity for social and economic progress.[16] On the other hand, as highlighted in Chapter 1, it also presents challenges when planning systems and public institutions are not equipped to deal with the challenges posed by rapid urbanization. Rapid population growth in cities, for instance, can lead to congestion and crowding when it is not anticipated with adequate infrastructure and housing and when the expansion of the city is not properly planned and managed. As a result, the population growth in cities, especially rapid growth, is a central concern as humanity moves into a future that is predominantly urban.

Uncovering some of these demographic trends using a harmonized global methodology that captures the urban-rural continuum in a consistent manner is therefore fundamental. In this regard, this section applies the Degree of Urbanization to briefly examine the demographic trends of the three classes of settlements that comprise Level 1 in Box 2.1. It provides a synopsis of previous decades before venturing into future projections of what is expected to unfold until 2070. Similarly, using this harmonized data, it peeks into future anticipated land-cover changes.

Over the past seven decades, the world has experienced significant population growth and notable demographic "megatrends," including urbanization, which have significant implications for economic and social development as well as environmental sustainability.[17] In 1950, the global population was relatively small at only 2.5 billion and mostly rural. By 2020, the global population had grown to 7.8 billion and most people lived in cities. This transformation has had big economic, social and environmental consequences which various chapters of this report examine with a view to achieving sustainable futures.

In 1950, most people lived in rural areas, followed by towns and semi-dense areas, while cities were the least inhabited. Faster growth in city population meant that by 1965, the global population was equally distributed across these three types of areas (Figure 2.3). By 1990, the order had reversed with most people living in cities, followed by towns and semi-dense areas, and then rural areas last. In 2020, almost half the global population lived in cities, while 29 per cent lived in towns and semi dense areas and 22 per cent in rural areas.

However, this large transformation is projected to slow into the future. Demographic growth has already started to decelerate and is projected to continue to do so over the coming decades. The share of population in cities is projected

The share of population in cities is projected to grow at a slower pace to reach 58 per cent of the global population in 2070, while the share in towns and semi-dense areas is expected drop to 24 per cent

to grow at a slower pace to reach 58 per cent of the global population in 2070, while the share in towns and semi-dense areas is expected drop to 24 per cent.

Notably, the population in towns and semi-dense areas has generally grown at the same speed as the total population between 1950 and 2020. As a result, it has maintained its population share of 30 per cent over that period, but the absolute number of people in these areas tripled from 750 million to 2.25 billion. The population in these settlements is projected to continue growing, but more slowly than the total population. Between 2050 and 2070, however, population in towns and semi-dense areas will start declining.

The rural population, on the other hand, has grown more slowly than total population from 1975 to 2020. This growth is projected to continue to slow down until 2050, after which a slight decrease in absolute numbers is expected. As a result, its population share has dropped from 38 per cent in 1950 to 22 per cent in 2020 and to 18 per cent in 2070.

In terms of geographic regions, data from the Degree of Urbanization shows Sub-Saharan Africa and Oceania to be having the lowest city population share in 1950 (Figure 2.4). These two regions—together with Northern Africa and Western Asia—are projected to experience the biggest increase in the city population share in the future. On the other end of the spectrum, Europe will experience the smallest increase in its city population share among the regions. In most regions, the population share will drop in both rural areas as well as towns and semi-dense areas. In the Americas, Europe, Australia and New Zealand, however, the population share in towns and semi-dense areas barely changes over time.

Figure 2.3: Evolution of population by degree of urbanization 1950–2070 in absolute and relative terms

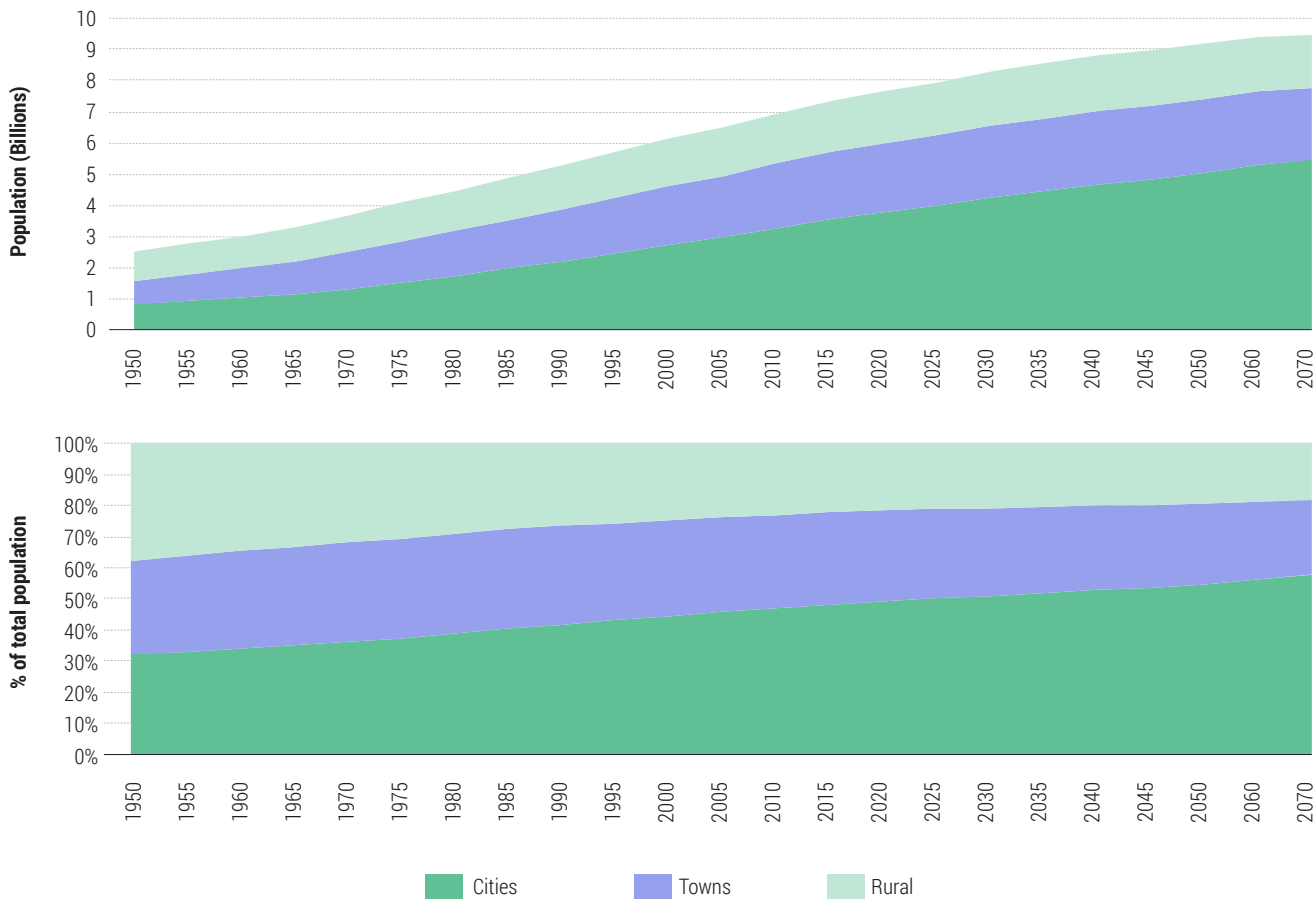
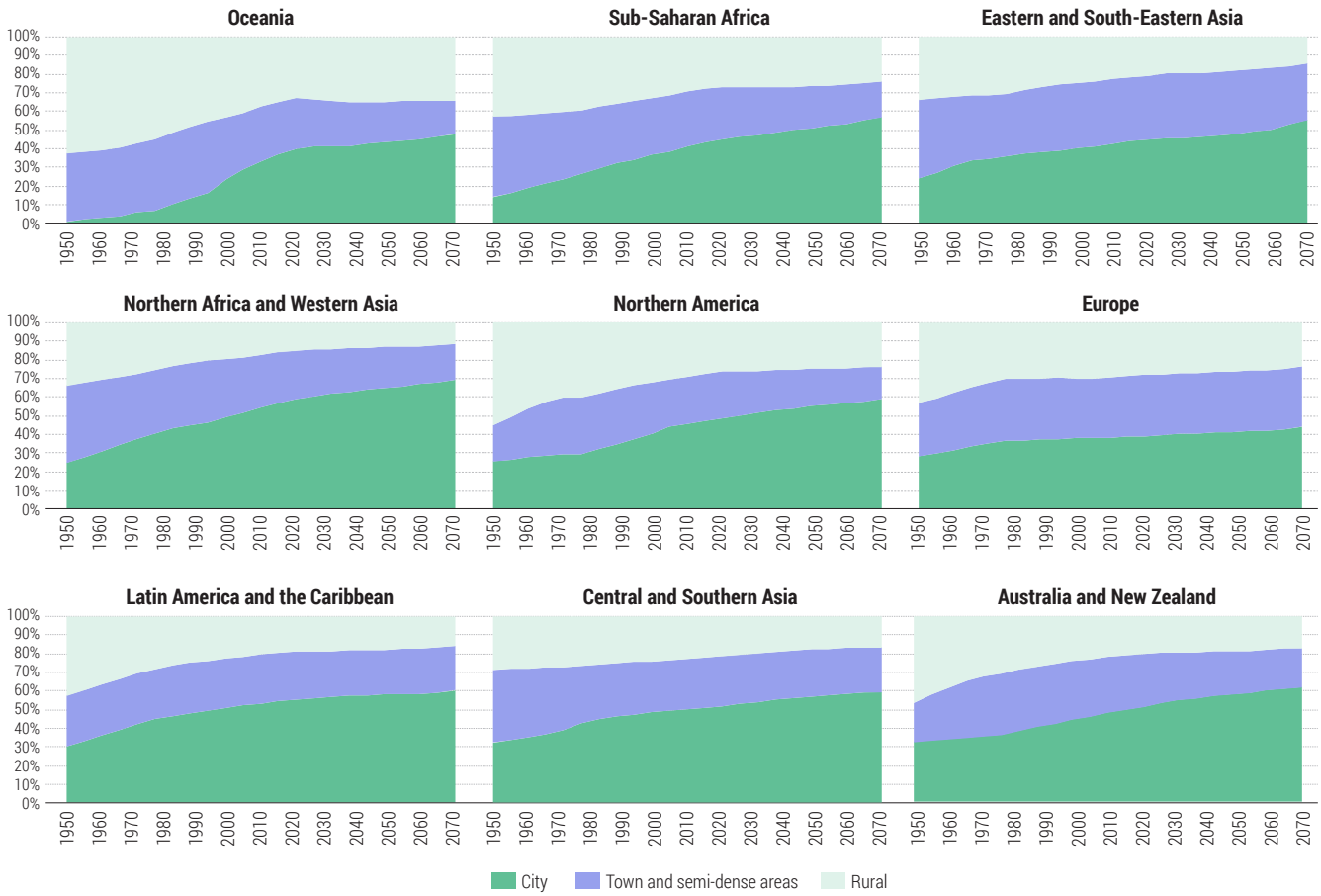
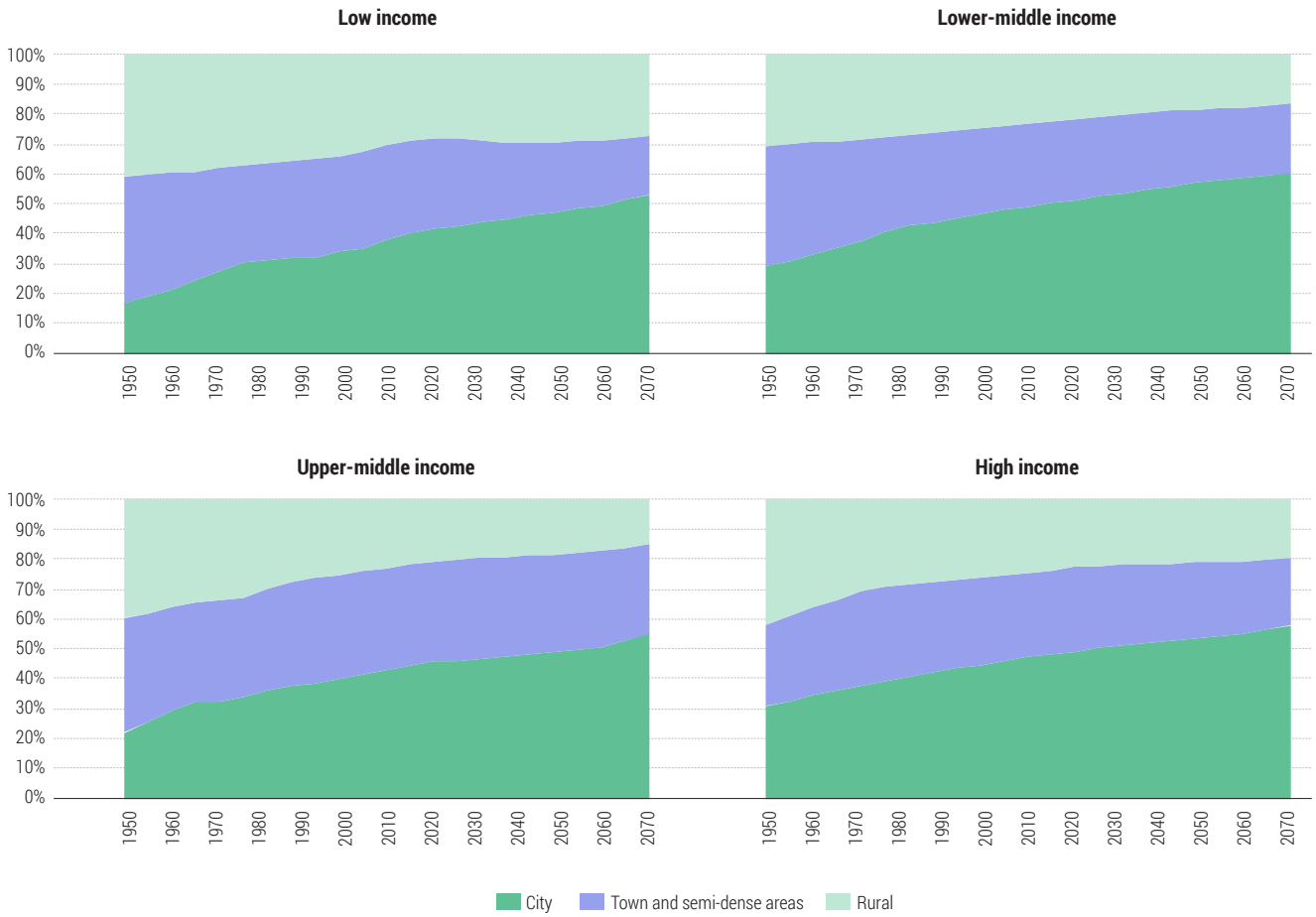


Figure 2.4: Population share by degree of urbanization and SDG region (1950–2070) ordered by city population share in 1950



Nairobi, Kenya © Kirsten Milhahn/UN-Habitat

Figure 2.5: Population share by degree of urbanization and income level (1950–2070)



When these demographic changes are assessed in terms of income groups, the data show that low-income countries had the smallest share of city population (17 per cent) in 1950, while high-income countries had the highest share (31 per cent). Because city population shares in low-income countries increased faster than in high-income countries, this gap has shrunk from 14 to 7 percentage points and is projected to drop to 5 percentage points by 2070 (Figure 2.5).

Over the past decades, population growth rates in lower-income countries have been higher than in other countries. This trend is expected to continue. By contrast, high-income countries have had relatively low population growth rates, which are projected to slow further and reach almost zero by 2070. Upper- and lower-middle-income countries have also experienced higher growth rates in the past decades, but they are also slowing down. The population of upper-middle-income countries is even projected to shrink from 2040 onwards.

The growth of population in cities, towns and semi-dense areas invariably leads to spatial expansion. Past studies have shown urban land area growing at a higher rate than population and, relatedly, population densities have also been declining as a result of more dispersed patterns of urbanization in the form of urban sprawl.[18] These trends significantly affect the environment and have profound socioeconomic repercussions. These effects include negative impacts on ecosystem services and increased energy consumption, higher cost of providing infrastructure (often leading to the uneven or unequal distribution of services), a

sustainable futures call for slowing down urban sprawl and, if possible, ensuring that the compactness of cities is maintained or increased over time in line with Target 11.3 of SDG 11

reduction in the economies of agglomeration and decreased urban productivity, among others. Yet, sustainable futures call for slowing down urban sprawl and, if possible, ensuring that the compactness of cities is maintained or increased over time in line with Target 11.3 of SDG 11—which also provides a measure of how efficiently cities "utilize" land.[19]

The Degree of Urbanization shows that the share of land occupied by cities is small (0.5 per cent in 2020), but has been growing (from 0.2 per cent in 1975) and is projected to keep growing (to 0.7 per cent in 2070) (Figure 2.6). In contrast, land covered by towns and semi-dense areas double between 1975 and 2020, but it is projected to start shrinking from 2040 onwards due to conversion to city and rural land. This projection also indicates that the amount of urban land is likely to shrink after 2050.

City land in low-income countries has been growing rapidly and is projected to more than double between 2020 and 2070 (Figure 2.7). Additionally, land covered by towns and semi-dense areas in low-income countries is projected to grow, but at a slower pace (+50 per cent between 2020 and 2070). In contrast, upper-middle-income countries are projected to experience the slowest increase in city land (+10 per cent between 2020 and 2070) and land covered by towns and semi-dense areas is likely to shrink, in part due to their shrinking population. Urban land in lower-middle- and high-income countries is projected to grow, but the pace slowing over time to reach almost zero between 2060 and 2070.

2.3. What is Driving Population Growth in Cities?

The previous section and Chapter 1 show that urbanization is pervasive although the level, pace and processes driving urbanization are uneven across the world. The previous sections of this chapter have also described nuanced trends along the urban-rural continuum based on the classes in new global definition ("cities," "towns and semi-dense areas" and "rural areas"). This section delves into the most distinct and unique pattern emerging at the global level that carries significant implications for urban futures: population growth in cities.[20]

Depending on how it is managed, population growth in cities can contribute to sustainable urban futures and deliver on the optimistic scenario described in Chapter 1 by increasing economic productivity, spurring innovations and new ideas that enable people to find a better job and better access to services. On the other hand, if this growth is not planned for and well-managed, it can exacerbate poverty and inequality (increasing the population of slums or poorly-serviced neighbourhoods), compound environmental problems and

Depending on how it is managed, population growth in cities can contribute to sustainable urban futures

Figure 2.6: Land covered by cities, towns and semi-dense areas, 1975–2070

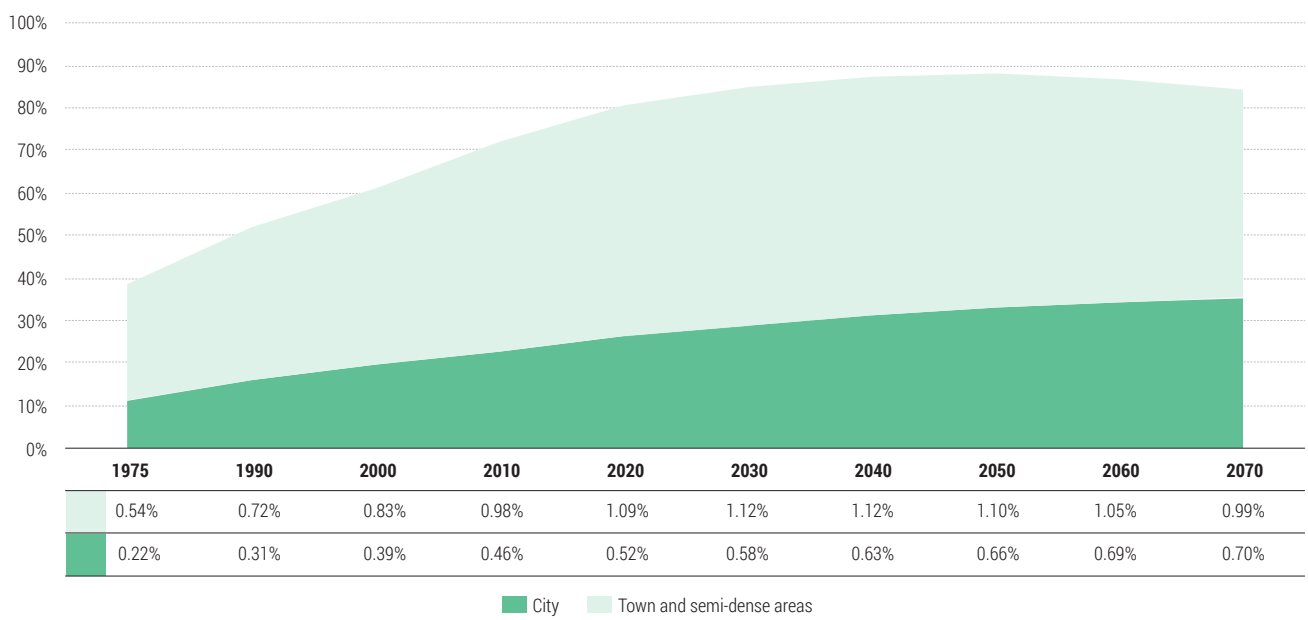
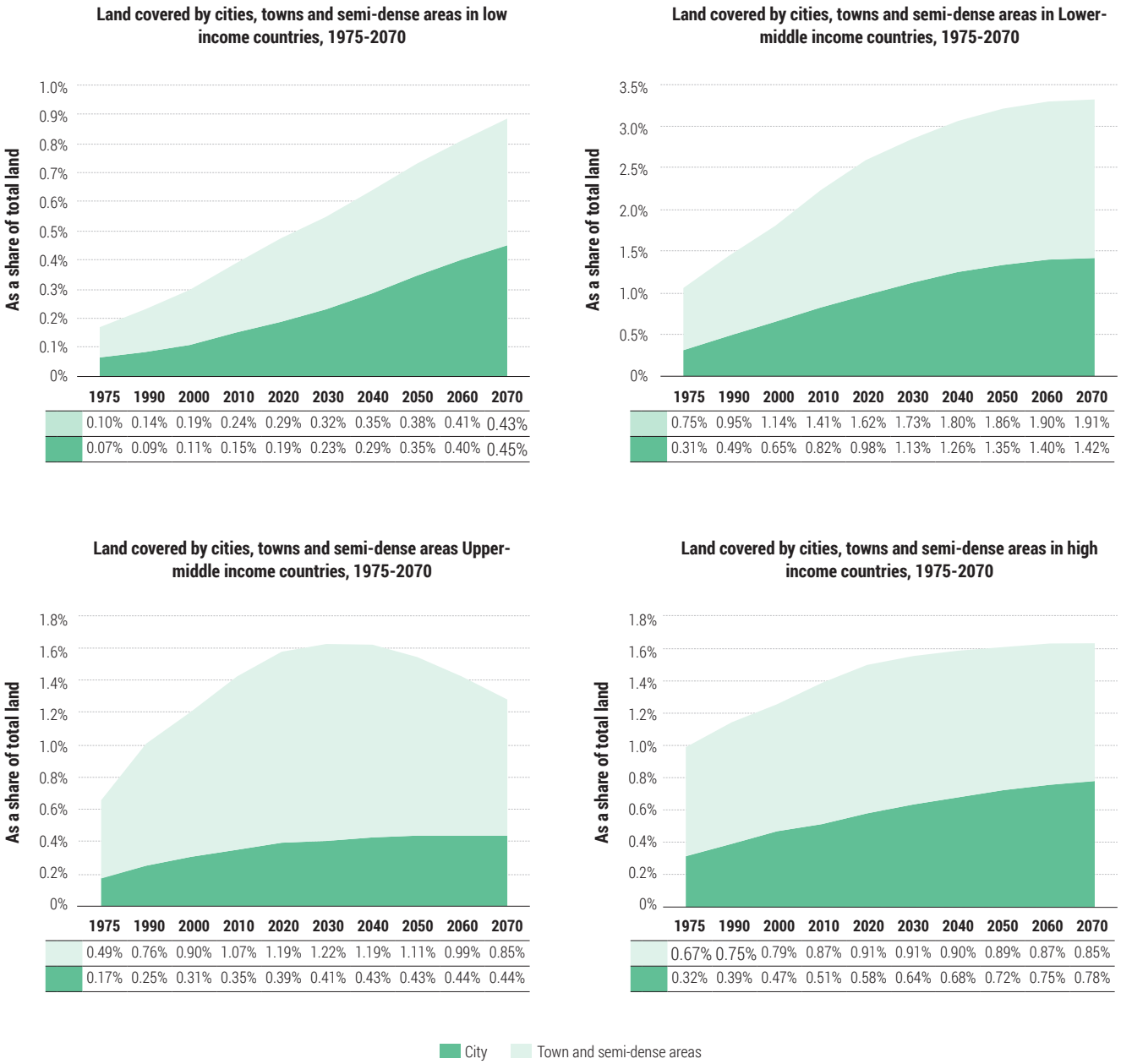


Figure 2.7: Land covered by cities, towns and semi-dense areas and income group, 1975–2070



pose challenges to the achievement of net-zero goal, thus leading to the pessimistic or even high damage scenarios described in Chapter 1. As a result, this section, using new data from the harmonized definition of cities in the Degrees of Urbanization approach, revisits the drivers of city population growth, including the questions of how cities expand, how new cities emerge and how the age of a city's population differs from those in the rest of the country.

2.3.1. Natural growth is the main driver of city population growth

Several studies have warned about the frequent overestimation of the role of rural-urban migration in the rapid urban growth recorded in last decades in particular in Sub-Saharan Africa.[21] Despite using different methodologies to understand the demographic drivers of urban growth, these studies generally agree that about 60 per cent of the

urban population increase is attributable to natural growth and the remaining 40 per cent is due to the combined effect of migration and reclassification of areas. Because most of the growth in city population is due to natural change and expansion, restricting migration into cities would have relatively little impact.[22]

These warnings and estimates are confirmed by the analysis of city population growth over time (Figure 2.8). In lower-middle- and low-income countries, city population growth is mainly determined by natural change (captured in the fixed share component, see Box 2.4). The influence of city-to-rural migration (captured by the change in share component) has been dropping over time and is projected to continue to do so. For example, between 2060 and 2070, the city population in low-income countries is projected to increase by 12 per cent. Two-thirds of this increase (8 per cent) stems from natural change (fixed share) and only one-third from rural-to-city migration (change in share).

In high-income countries, both components (fixed share and change in share) contribute equally to growth, and both are shrinking over time. In upper-middle-income countries, the contribution of the natural change (fixed share) is decreasing at a faster rate than rural-to-city migration (change in share) and becomes negative after 2040. This decline is because the national population is projected to shrink from 2040 onwards and only the rural-to-city migration ensures that city populations continue to grow.

Box 2.4: Different drivers of population change

National population change is often broken down into "natural change" (the difference between the numbers of births and deaths) and "net migration" (the difference between in-migration and outmigration). At the national level, this natural change and international net-migration data are usually available. Measuring population change at the city level, however, is more complicated. At the city level, net migration has to consider both international and internal migration. Data is usually not available for natural change at the city level. Finally, the boundaries of a city can change over time, leading to a reclassification of population. As a result, this chapter splits population growth in two different ways.

City population growth can be split into two components based on the changes in the city population share:

- **Fixed share** shows how much the population of a city would grow if its share of the national population remained fixed. This would be the case if it had the same natural change and net-migration rate as its country did. In lower-income countries, this will primarily be driven by natural change.

- **Change in share** shows how much the population of a city grows because its share of the national population changed. This share can grow due to net migration, expanding city boundaries and differences in natural change. In lower-income countries, this will be mainly driven by rural-urban migration.

City population growth can also be split into change and reclassification:

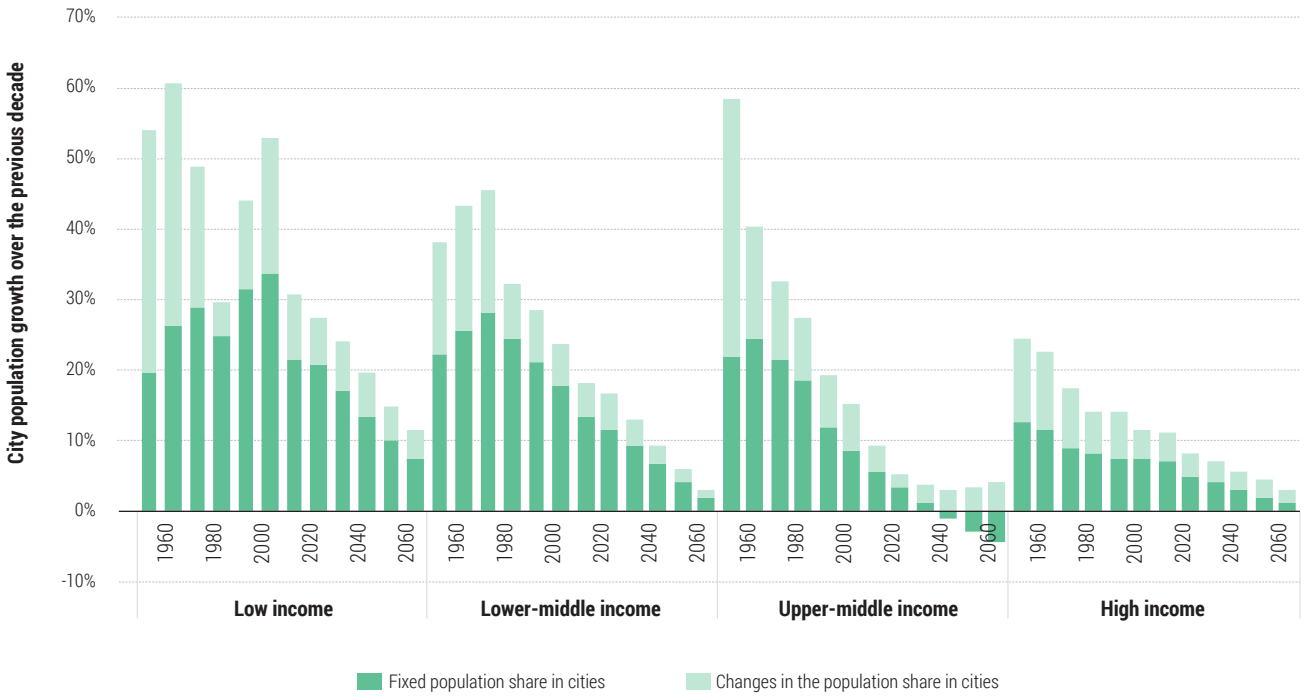
1. Population change:

    i. Within the initial boundaries of the city.
    ii. Within areas that are newly classified as a city.

2. Reclassification: Initial population in areas that are newly classified as (part of) a city.

    i. Expansion: Rural, suburban and peri-urban areas that have been added to a city.
    ii. Annexation: A town is added to a city.
    iii. A new city: An area, typically a town or village, grows enough in population and density to be classified as a city.

Figure 2.8: Components of city population growth, 1960–2070



2.3.2. Expanding cities and new cities

One important, and often ignored, driver in expansion of city population is represented by the changes in the classification of an area. So far attempts to explicitly account for the role of reclassification in explaining urban growth have been hindered by the lack of harmonization in the definitions and the absence of detailed boundaries. However, with the new definitions and by using spatial methods applied on population grids, some studies have started to demonstrate how this role is far from being negligible.[23]

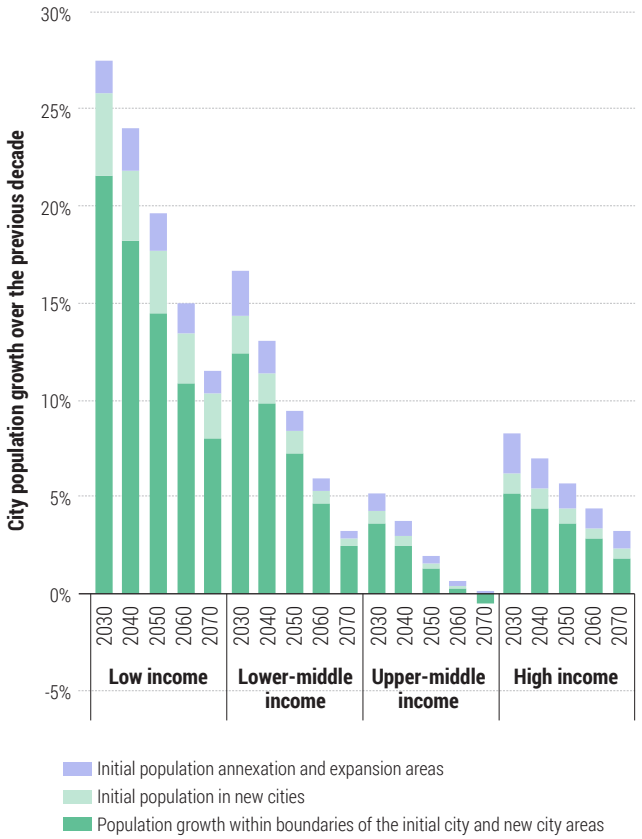
As population grows, some areas originally classified as towns or rural areas are reclassified as cities and their population starts to contribute to city population growth. The other sources of city population growth are natural change and migration. By applying the classification by Degree of Urbanization at multiple points in time, the impact of the change in classification for each cell can be captured and aggregated. Overall, the spatial expansion of cities and the emergence of new cities are projected to contribute between 20–40 per cent of the growth in city population. However, as highlighted in the previous subsection, most population growth in cities is due to natural change (fixed share) and most of that growth will occur within the initial boundaries of a city, while reclassification will add less and less to city populations (Figure 2.9).

Most new cities will be towns that have grown to attaining the threshold for "city" classification as per the Degree of Urbanization harmonized definition. The contribution of these reclassifications is higher in low-income countries and leads to a 5 per cent increase city population per decade. Further, from the spatial analysis using the Degree of Urbanization approach, the transformation of a rural area directly to city can also be observed in low-income countries. This phenomenon, however, does not happen in countries with higher incomes.

In high-income countries, new cities will be rare. Between 2060 and 2070, new cities are projected contribute to increase the city population by only 0.5 per cent. In contrast, in low-income countries the emergence of new cities between 2060 and 2070 is projected to increase the city population by 2.3 per cent. The emergence of new cities of small size poses challenges in terms of urban governance for low-income countries. The previous World Cities Reports

the spatial expansion of cities and the emergence of new cities are projected to contribute between 20–40 per cent of the growth in city population

Figure 2.9: The role of reclassification in city population growth during the previous decade, 2030–2070



have highlighted the plight of secondary or intermediary cities in most countries. Often, these cities face challenges in managing urbanization. They struggle to attract investments; generate employment; and meet the demand for housing, infrastructure and basic urban services.[24]

asymmetrical development compounds the urban spatial divide

Despite these challenges, policy discussions on urbanization have been dominated in the past by their attention on the unprecedented growth of megacities and large cities. As illustrated in Chapter 4, the "winner-takes-all" phenomenon propels megacities and large cities to growing economically faster than others creating more localized development as opposed to allowing more diffused spatial development across territories. Such asymmetrical development compounds the urban spatial divide, especially with regard to secondary cities—whose populations, especially in regions such as Sub-Saharan Africa, often face multiple deprivations relating to income and employment, water and sanitation, health and housing.[25]

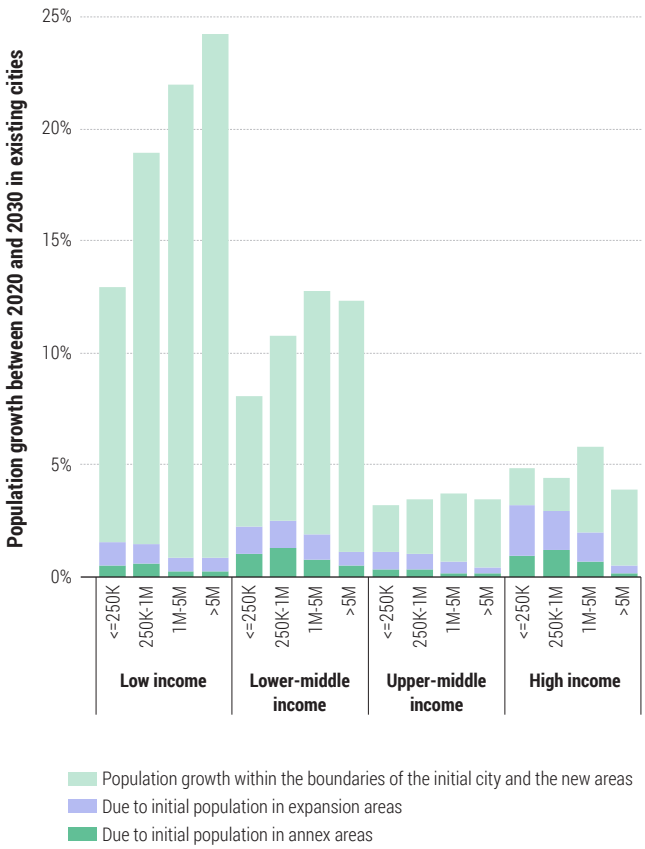
To realize sustainable urban futures, an integrated and territorial approach to urban development is imperative

To realize sustainable urban futures, an integrated and territorial approach to urban development is imperative. Various levels of government can develop and implement national urban policies and strategies that ensure integrated spatial growth and development to harness the potential of such small and intermediate cities within national urban systems. These settlements offer a significant, but often untapped, potential for achieving the Sustainable Development Goals and contributing to sustainable futures. The poor data and information on these cities pose severe challenges for evidence-based policy formulation. For instance, the lack of sufficient geographic detail and of a harmonized definition makes it impossible to unpack the specific components of urban growth.

In low-income countries, expansion and annexation account for a relatively small share of city population growth and the high growth rates are mainly driven by population growth within the initial city boundaries and the new city areas (Figure 2.10). On the other hand, expansion and annexation are more important in high-income countries because cities

Medellin, Colombia © Kirsten Milhahn/UN-Habitat

Figure 2.10: City population growth between 2020 and 2030 by city size, income group and source of growth



tend to be surrounded by larger suburbs, which are absorbed by the city as it expands. This tendency is particularly the case for small cities, where the population of the surrounding suburbs is more important relative to the city population than is the case for larger cities.

2.3.3. Cities attract more young adults, while rural areas have more children

In the rural areas of low- and lower-middle-income countries, children as a share of the rural population is higher than the share of children in the city population (Figure 2.11). These higher shares reflect the higher fertility rates in rural areas which is documented in several analyses based on Demographic and Health Survey data.[26] Between 1950 and 2050, the slopes of the lines for children do not change substantially, but tend to shift downwards. This indicates an overall reduction in the share of children at the country level, but illustrates no fundamental changes in rural/city differences.

In the rural areas of low- and lower-middle-income countries, children as a share of the rural population is higher than the share of children in the city population

In upper-middle-income countries, a reduction of the intercept between 2050 and 2000 shows the effect demographic transition in terms of changes of overall age structure at national level. This change is also accompanied by a flattening of the lines, which indicates that rural areas are converging towards the lower fertility and mortality levels found in cities.

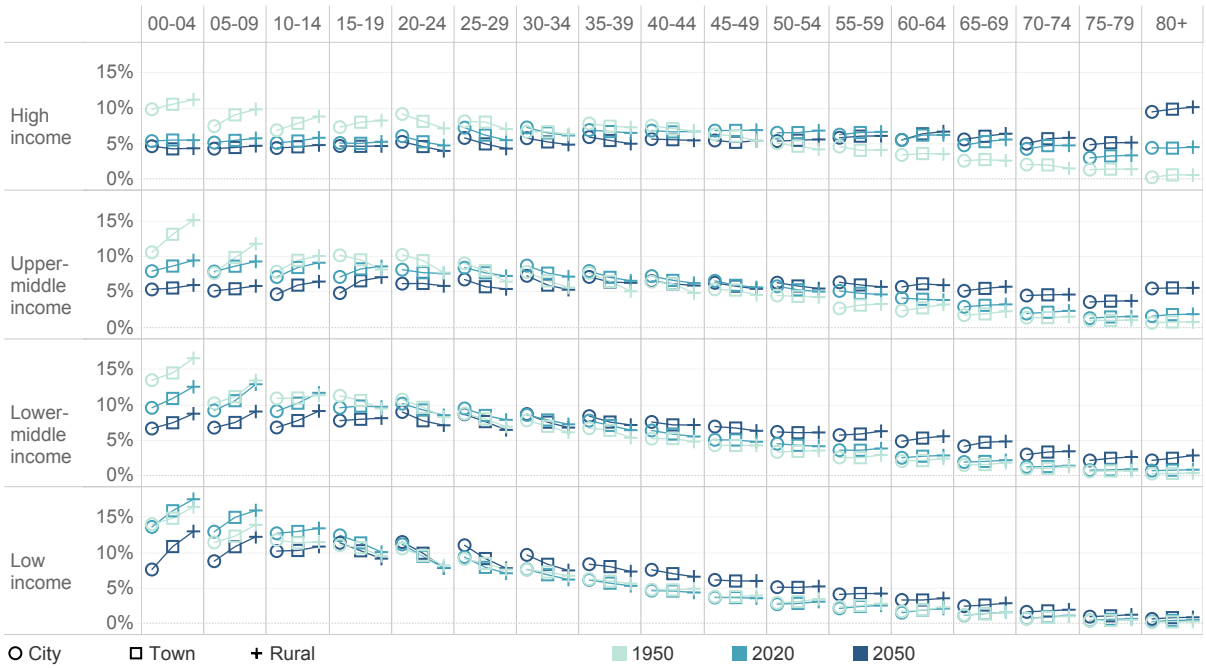
While differentials in age structure for the age groups of children can be mainly attributed to fertility and mortality, differences in other age groups stem both from cohort effects (population residing in the areas moving to the next age group) and migration patterns which can also have a strong age component.[27]

In all income groups, the slopes invert from positive to negative when moving from children to young adults' cohorts. This inversion indicates that cities attract more younger adults relative to towns and rural areas. In low-income countries, the slopes are more pronounced and the inversion is anticipated to the age group 15–19. For high-income countries, the negative slope starts at age 20 in correspondence with migrations of students to cities for tertiary education.

Another inversion that can be observed after age 50, particularly in high-income countries, denotes how population ageing is affecting rural areas. This trend is likely attributable to migrations from cities to rural areas in correspondence with retirement. Differentials in age distribution between cities, towns and rural areas have implications both for the ageing of population in countries in advanced stages of their demographic transition and for countries with still high fertility rates and large youth populations.

Overall, the large share of youth population in cities is expected to persist. If accompanied by favourable conditions, large youth bulges concentrated in cities of developing countries represent the source of a demographic dividend. In the absence of such conditions, they pose several demographic and socio-economic challenges. Provided there are sufficient employment opportunities, a large youth population frees up resources for investments and boosts productivity. [28] This positive effect holds true irrespective of the level of income and geographical area. Where employment opportunities are lacking, youth bulges may be a source of unrest, violence and conflicts.[29]

Figure 2.11: Population share by age group in cities, towns and semi-dense areas, and rural areas in 1950, 2020 and 2050



Note: This graph shows the population share for five-year age groups by Degree of Urbanization for three points in time. The data points of the three classes of the Degree of Urbanization are connected by a line. A line with an upward slope means that a higher share of that age groups lives in rural areas as compared to cities. A line with a downward slope means that a higher share of that age group lives in cities as compared to rural areas.

2.4. Growth in Cities is Slowing Down, but Less for Large Cities

More than a decade ago, the UN-Habitat flagship report State of the World Cities 2008/09 described cities as "one of humanity's most complex creations, never finished, never definitive. They are like a journey that never ends. Their evolution is determined by their ascent into greatness or their descent into decline. They are the past, the present and the future."[30] The analysis of previous and anticipated future trends using the harmonized definition of cities provides an insight into this evolution of cities in a coherent way. As alluded to in previous sections, it shows that cities have been growing demographically and spatially and will continue to do so.

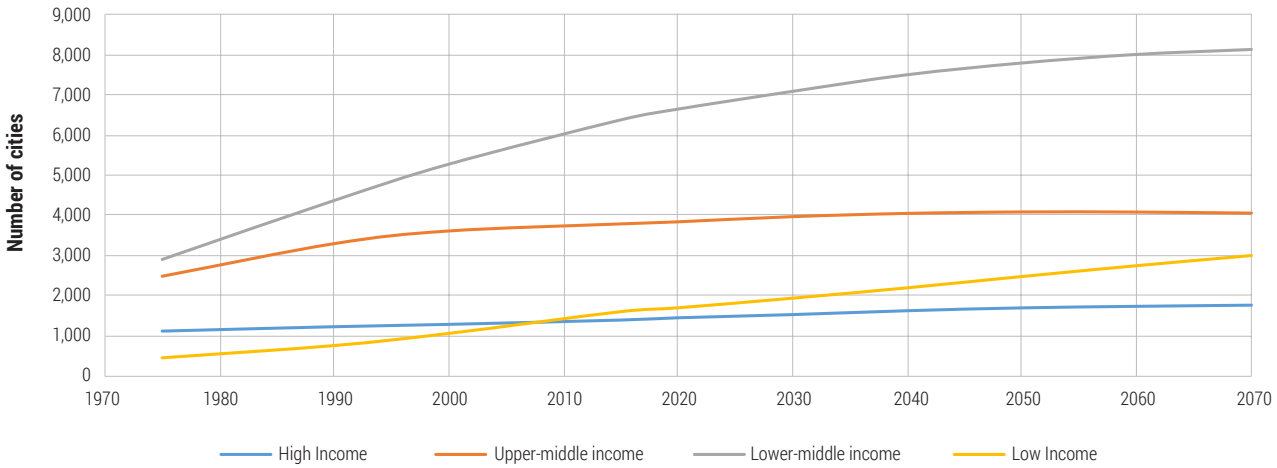
At the same time, the data paint a picture of overall growth: the number of cities globally doubled between 1975 and 2020 to 14,000. However, the data also show that the growth in the number of cities will slow down—with only another 3,000 new cities appearing over the next 50 years. As the following subsections will illustrate, this global slowdown in the growth of the number of cities hides a lot of variation, some based on size of cities (Box 2.5), income grouping and geographic region. Some will even experience population loss and shrinkage in the future.

Box 2.5: City size classification

Cities as defined by the Degree of Urbanization are divided into four size classes:

1. Small cities have a population between 50,000 and 250,000 inhabitants.
2. Medium-sized cities have a population between 250,000 and 1 million inhabitants.
3. Large cities have a population between 1 and 5 million inhabitants.
4. Very large cities have a population of a least 5 million inhabitants.

Figure 2.12: Growth in the number of cities 1975–2070 by income group



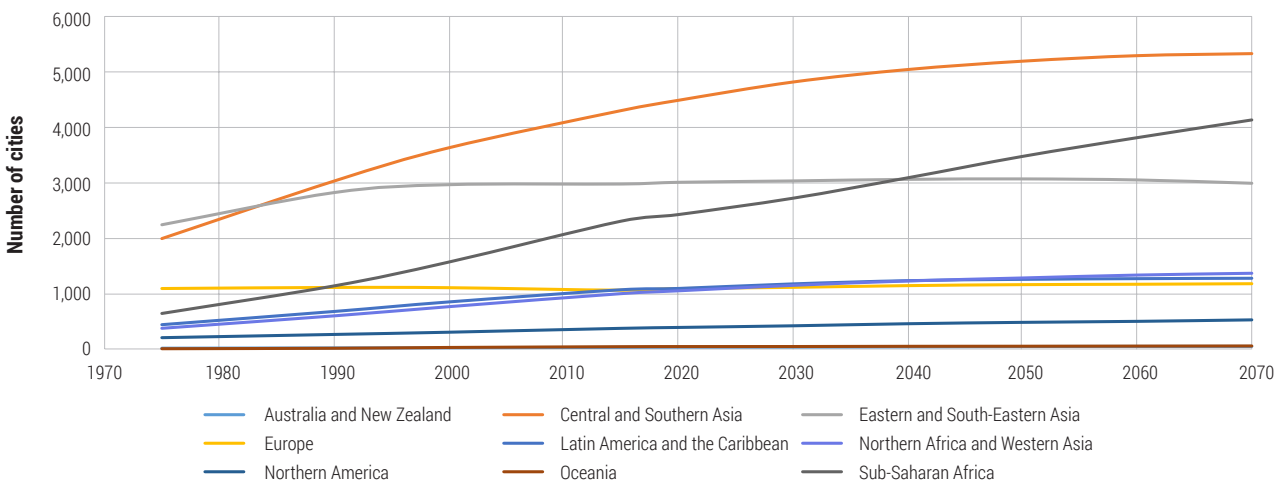
2.4.1. Cities in low-income countries continue to grow in numbers

Low-income countries experienced the largest increases in the number of cities between 1975 and 2020 (+270 per cent), while high-income countries experienced the smallest increase (+30 per cent). Increases in middle-income countries were between these two extremes (+55 per cent and +130 per cent) (Figure 2.12). Projections indicate that, between 2020 and 2070, the number of cities in low-income countries will grow far more than in the rest of the world. An increase of 76 per cent, compared to 6 per cent in upper-middle-income countries. The number of cities in high-income and lower-middle-income countries will both increase by about 20 per cent.

From a geographical perspective, the two regions with the biggest absolute increase in the number of cities between 1975 and 2020 are Central and Southern Asia (+2,500) and Sub-Saharan Africa (+1,800) (Figure 2.13). According to the projections, they will also experience the biggest increases between 2020 and 2070 (+850 and + 1,700, respectively).

The two regions with the lowest relative increase in the number of cities between 1975 and 2020 are Europe, where they remained constant, and Eastern and South-Eastern Asia, where they increased by 35 per cent. The projections also suggest that the growth in cities will remain low in these two regions. In Europe, the number of cities is projected

Figure 2.13 Growth in the number of cities 1975–2070 by region of the world



to increase by only 9 per cent between 2020 and 2070 while the number of cities is projected to remain constant in Eastern and South-Eastern Asia.

The biggest increase in cities with 1 or 5 million inhabitants between 2020 and 2070 is projected to happen in Sub-Saharan Africa and Central and Southern Asia. In Sub-Saharan Africa, the number of cities with at least 1 million inhabitants will increase from 60 to 134 over the next 50 years and those with at least 5 million will increase from six to 28. For Central and Southern Asia, the respective increases are from 117 to 183 and from 16 to 31. In all other regions, the increase is much lower. Notably, Eastern and South-Eastern Asia is projected to see a small reduction of cities with at least 5 million, from 29 to 27.

2.4.2. In more developed countries, the largest city tends to be more important

Urbanization and the concentration of population in cities is seen by standard economic geography as a finite and beneficial process, part of the transformation from agrarian to industrialized societies. Higher concentration has been historically associated with economic development, improvements in living standards, better education, lower fertility, technological development and increased productivity. However, these outcomes are not guaranteed, especially in poorer countries, and urbanization by itself is not a sufficient condition for economic development.[31]

The new harmonized definition and data set allow us to capture primacy, or the relative importance of the biggest city, in two ways: (a) by calculating the population in the largest city relative to total city population in a country and (b) via the Hirschman-Herfindahl Index (HHI), a common measure of concentration.[32] Noteworthy, because, for most countries, it was not possible to obtain data for each city, most studies relied on a less suitable indicator: the population of the largest city as a share of the national population.

Overall, primacy tends to be higher in smaller countries as well as in more developed countries (Table 2.1). A small country may only have a single city, leading to high primacy. For example, Bahrain, Lesotho, Mauritius, Timor-Leste and Singapore only have one city. In a large country, a single city cannot capture a large share of the country's city population. For example, in India the biggest city only accounts for 4 per cent of the country's city population. The city population share in the largest city decreases from 69 per cent in small countries (1 to 5 million total population) to 21 per cent on average in very large countries (i.e., with more than 100 million inhabitants); HHI decreases from 56 per cent on average in small countries to 8 per cent on average in very large countries.

Figure 2.14: Number of cities with at least 1 or 5 million inhabitants per region, 2020–2070

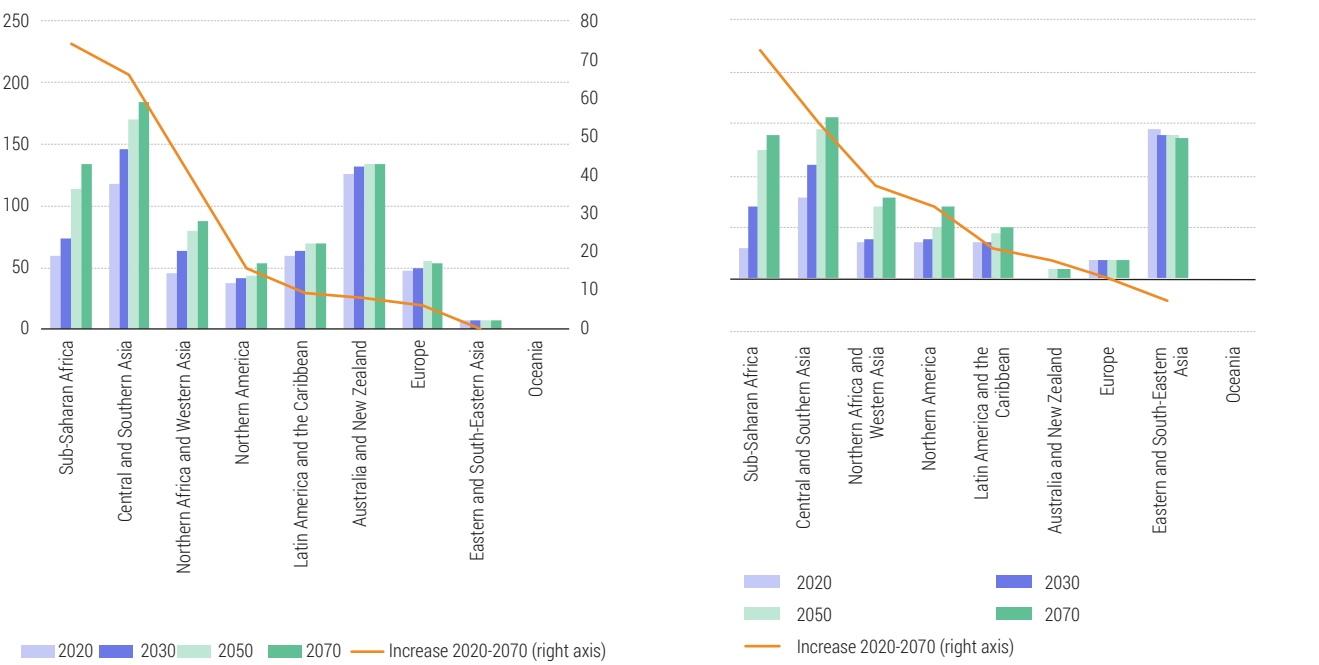


Table 2.1: Urban primacy by country size and income group or SDG region, 2020

Country population size group	1-5 million	5-10 million	10-25 million	25-50 million	50-100 million	> 100 million	Total
Population in largest city as share of population in all cities							
Low Income	62%	63%	37%	37%	29%	6%	41%
Lower-middle income	77%	46%	47%	28%	32%	24%	44%
Upper-middle income	62%	55%	40%	34%	35%	18%	45%
High Income	74%	62%	47%	25%	31%	25%	53%
Oceania		8%					8%
Northern America				30%		10%	20%
Central and Southern Asia		50%	43%	35%	26%	15%	34%
Australia and New Zealand	61%			28%			45%
Sub-Saharan Africa	65%	60%	35%	39%	31%	9%	45%
Europe	62%	54%	43%	18%	24%	22%	47%
Latin America and the Caribbean	71%	57%	44%	39%	27%	22%	49%
Northern Africa and Western Asia	82%	53%	50%	23%	30%	32%	50%
Eastern and South-Eastern Asia	96%	84%	56%	31%	45%	31%	54%
All	**69%**	**56%**	**42%**	**31%**	**32%**	**21%**	**46%**
Herfindahl- Hirschman Index							
Low Income	45%	43%	19%	17%	12%	1%	24%
Lower-middle income	67%	29%	28%	12%	13%	9%	28%
Upper-middle income	47%	38%	21%	16%	17%	5%	29%
High Income	61%	46%	28%	12%	15%	11%	38%
Oceania		3%					3%
Northern America				13%		3%	8%
Central and Southern Asia		29%	25%	14%	8%	5%	17%
Australia and New Zealand	40%			17%			29%
Sub-Saharan Africa	54%	40%	18%	20%	13%	1%	29%
Europe	45%	37%	25%	7%	9%	6%	30%
Latin America and the Caribbean	54%	39%	25%	20%	10%	7%	31%
Northern Africa and Western Asia	72%	35%	31%	7%	11%	12%	35%
Eastern and South-Eastern Asia	93%	74%	35%	13%	25%	14%	39%
All	**56%**	**39%**	**23%**	**14%**	**15%**	**8%**	**30%**

Note: SDG regions ranked from low to high primacy. Countries with less than 1 million inhabitants are not included.

Primacy also tends to be higher in high-income countries than in lower-income countries, but the relationship is complex. Econometric analyses show that the relationship between the concentration of population in the biggest city, or primacy, and economic growth is not linear. Given the population size and the level of development of a country, there is an optimal range of primacy where it contributes to economic growth, beyond which it acts as a brake on development.[33]

As population continues to grow in most countries, primacy is also projected to drop. On average, city primacy in 2020 was 46 per cent, which is slightly lower than in 1975 (49 per cent). Projections indicate that it will continue to drop, reaching 45 per cent in 2070. The HHI shows the same pattern: decreasing from 36 per cent in 1975 to 30 per cent in 2020 and projected to reach 29 per cent in 2070.

The two regions with the highest average primacy are Eastern and South-Eastern Asia and Northern Africa and Western Asia. In both, primacy tends to be significantly higher in in the various country population size groups, which may indicate that excessive primacy could limit economic growth. Faster population growth of the smaller cities in these countries would reduce their primacy and may help to reduce pressure on the largest city.

2.4.3. More and more people are living in large cities

City population growth varies by income group and city population size (Figure 2.15). In low-income countries, city population increases from below 100 million people in 1975 to more than 700 million people in 2070. Most significant change takes place in the cities with more than 5 million inhabitants. Low-income countries did not have a single city of this size in 1975. By 2020 there were three cities with more than 5 million inhabitants, which hosted about 18 million people: Dar es Salaam, Tanzania; Kabul, Afghanistan; and Kinshasa, Democratic Republic of the Congo. By 2070, low-income countries are projected to have 15 cities in this class with a cumulative population exceeding 150 million people. The total population in cities of between 1 and 5 million inhabitants was only 18 million in 1975. That figure tripled to 70 million in 2020 and is projected to double by 2070 to reach almost 140 million.

The total population in cities of between 1 and 5 million inhabitants was only 18 million in 1975. That figure tripled to 70 million in 2020 and is projected to double by 2070 to reach almost 140 million

Population in cities in lower-middle-income countries is projected to increase from half a billion to 2.5 billion people between 1975 and 2070. Population increases were the biggest for cities with at least 5 million inhabitants, increasing from 60 to about 360 million between 1975 and 2020 (+500 per cent). The projections indicate that this population will further increase to 830 million by 2070.

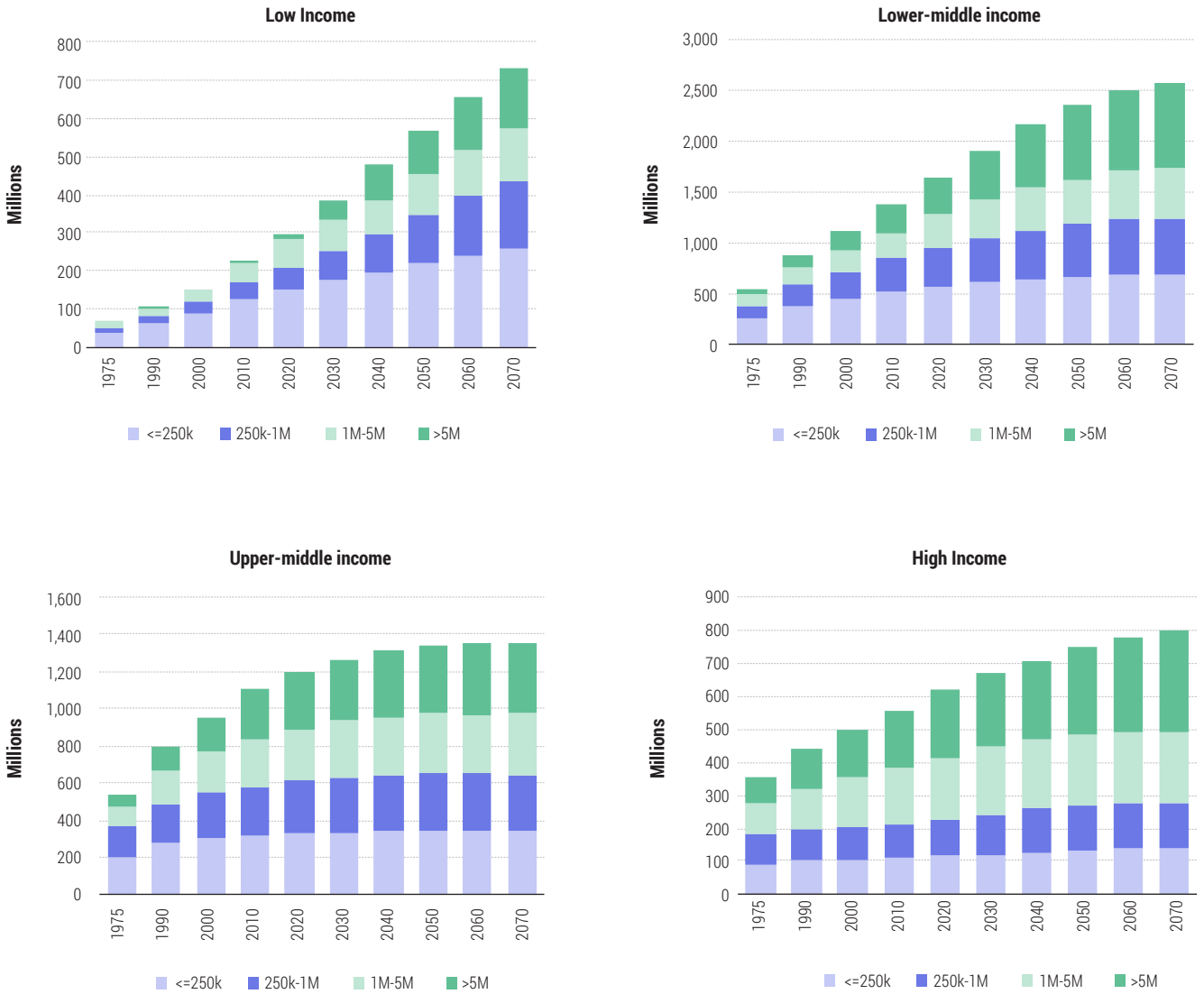
City population in upper-middle-income countries increased from 540 million people in 1975 to 1.2 billion people in 2020, but projections show that the population size will level off over the coming decades, stagnating at around 1.35 billion between 2050 and 2070. The largest increments in city population in these countries have taken place prior to 2020. Noteworthy, the growth in city population is concentrated in cities with at least 5 million inhabitants, which increased from 65 million in 1975 to 310 million in 2020 (+400 per cent). It is projected to still increase, but at a much slower rate, to 370 million by 2070 (+20 per cent). Population in smaller cities grows more slowly in upper-middle-income countries.

City population in high-income countries grew from about 350 million people in 1975 to about 615 million people in 2020, and is projected to pass 800 million people in 2070. Notably, cities with at least 5 million inhabitants are exhibiting an almost similar trend. These cities had a population of only 80 million in 1975, which increased two and a half times to reach 200 million in 2020 and is projected to reach over 300 million in 2070. On the other hand, the slow growth recorded in smaller cities is projected to continue into the future. However, as noted in Chapter 1, the COVID-19 pandemic has resulted in a net population decline of some large cities of countries like the US as people migrate to smaller cities and towns, a shift speculated to be temporary.

There are significant differences between income classes when it comes to the change of city numbers over time. Overall, there is an accentuated growth of cities in lower-income countries. This trend is particularly clear from Figure 2.16 in the low-income subplot (top-left quadrant), where there is a linear growth of cities in all city size classes, except from the largest size class (with more than 5 million inhabitants). The growth of the number of cities with at least 5 million inhabitants in low-income countries is high and increases over time.

Dhaka Cityscape © Joker King/Shutterstock

Figure 2.15: City population by city size and income group, 1975–2070



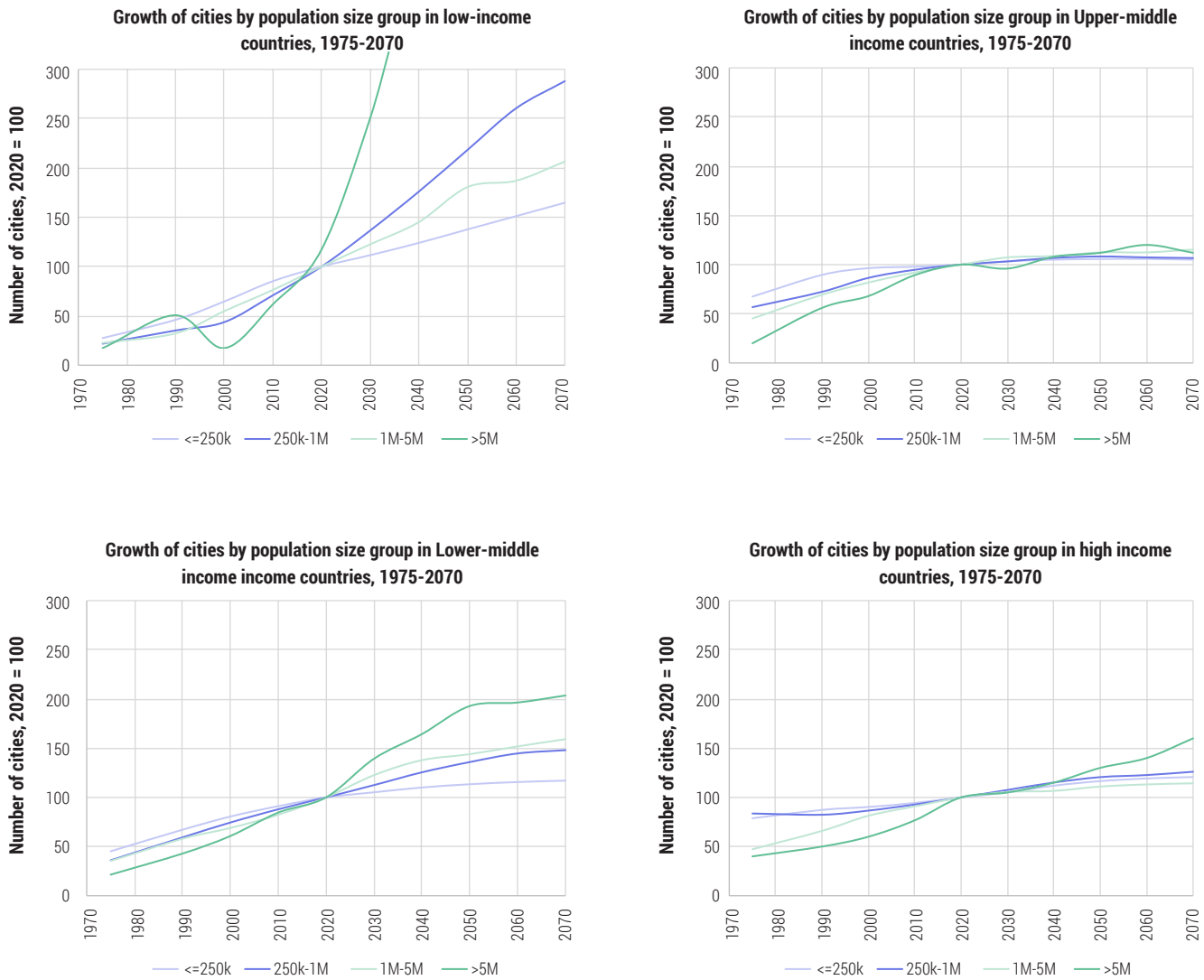
In the lower-middle-income countries (top-right quadrant), the number of large cities grew slightly faster between 1975 and 2020. Projections indicate that this process will continue with higher growth in the number of cities with at least 5 million inhabitants while the growth in the smaller cities slows down.

In upper-middle-income countries (bottom-left quadrant), the number of cities stabilizes after 2020 for all city classes. In high-income countries, the number of cities with at 5 five million inhabitants continues to grow also beyond 2020, while the number of smaller cities only increases slightly.

2.4.4. Most growth in city land will occur in low-income countries

As the world continues to urbanize, sustainable urban futures depend increasingly on the successful management of this urban growth. This expansion should be anticipated with sound planning policies and related actions that guard against dysfunctional and exploitative development practices such as land speculation and unserviceable sprawl, which cause inefficiencies and distortions that undermine the urban economy.[34]

Figure 2.16: Growth of the number of cities by population size and income group, 1975-2070



The successful management of this urban growth—especially in low-income and lower-middle-income countries, where the pace of urbanization is projected to be the fastest—is key for sustainable development.[35] The new data from the Degree of Urbanization approach show that changes—in terms of growth of city land area from 2020 levels—will mostly take place in low-income countries (+141 per cent), lower-middle-income (+44 per cent) and high-income countries (+34 per cent) (Figure 2.17). Changes in upper-middle-income countries are projected to be relatively small (+13 per cent). Growth of physical extent of city land is projected to be highest in Oceania (+109 per cent) and Sub-Saharan Africa, where it is projected to almost double.

The rapid spatial expansion of the physical extent of cities in Sub-Saharan Africa, for instance, is to a large extent attributed to peri-urbanization. The region is experiencing continual engulfment of un-serviced land in a mostly informal process largely driven by low-income households attempting to secure land that is affordable and in reasonable locations.[36] Recent studies have also confirmed that this rapid spatial expansion is taking place at a higher pace in small and secondary cities than it is in large cities.[37]

Often, government structures, institutional capacities, regulatory frameworks and land tenure systems in most countries in Sub-Saharan Africa are not able to respond

effectively to the emergence of these new settlements. As such, expansion areas are not well-planned and, as well, lack public goods and social amenities—thus charting an inefficient and unsustainable spatial development path with significant negative implications e.g. for rural livelihoods, agriculture and food security.[38]

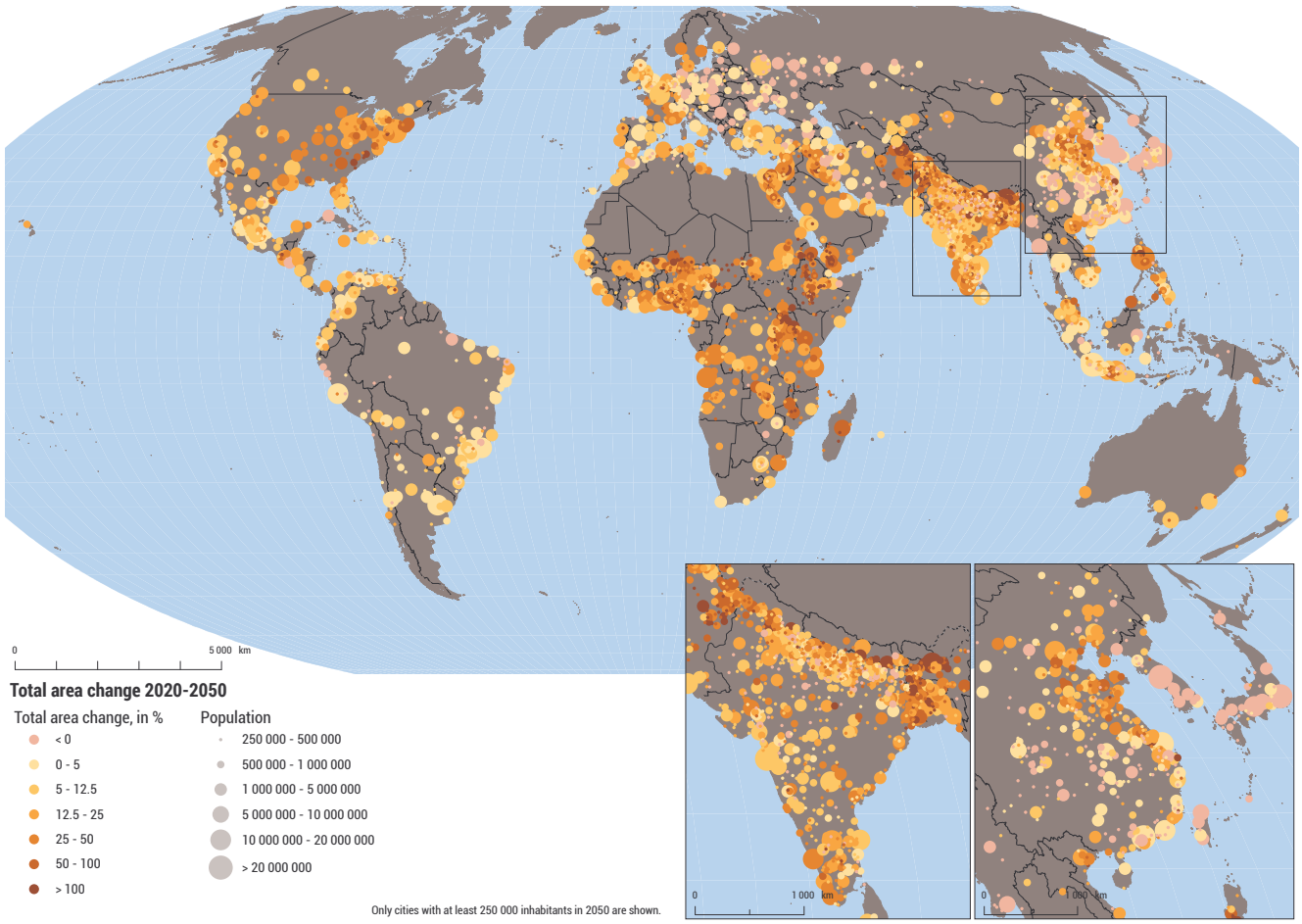
On the other hand, the projections show that lowest growth in city land will be in Eastern and South-Eastern Asia (+10 per cent), Latin America and the Caribbean (+14 per cent) and Europe (+16 per cent). These regions are relatively highly urbanized and will be experiencing some of the smallest increase in city population share (Figure 2.4). Notably, a number of cities in these regions are projected to experience some level of shrinkage (Map 2.1).

Shrinkage is not a new phenomenon. Past UN-Habitat flagship reports have recorded this phenomenon in both developing and developed countries, triggered by various reasons.[39] Shrinking cities are often characterized by deteriorating living conditions, environmental degradation, urban decay such as property abandonment and a rise in inequality. These worsening conditions force residents to seek opportunities in other cities that offer higher quality of life, further spiralling shrinking cities into long-term population loss if necessary measures and strategies are not implemented to tackle the decline.[40]

While most of the cities projected to shrink by 2050 are small (in Armenia, Barbados, Belarus, China, Cuba, El Salvador, Georgia, Germany, Japan, Moldova, Republic of Korea, Russia and Ukraine), there are notable large cities whose land area is projected to shrink by more than one-tenth by 2050. These include Daegu, Republic of Korea (-14 per cent); Kitakyushu, Japan (-15 per cent); and Saint Petersburg, Russia (-20 per cent). The management of shrinking cities requires innovative measures and strategies by policymakers (Box 2.6). For example, Kitakyushu City—once renown as a major iron and steel centre during the rapid industrialization years of Japan and now home to the fastest-growing ageing population—has adopted green growth strategies to address population decline and ensure regional revitalization.[41]

Figure 2.17: Growth of city land by income group and region, 1975–2070

Map 2.1: City land area change, 2020–2050



Ouagadougou (Burkina Faso) is an example of a rapidly growing capital in Africa © Felix Vollmann/UN-Habitat

Box 2.6: Shrinking cities: Planning for future growth while anticipating decline

Management of shrinking cities requires innovative skills and strategies to contain population flight and attract new residents. Policymakers should consider the following:

- Continuous monitoring is indispensable to understand population and spatial changes for evidence-based policy formulation and future planning. This is useful in assessing the persistent presence of urban growth or shrinkage. In most places, poor data and information (often lacking geographical detail) creates challenges for evidence-based policy formulation.
- Regional integration, connectivity and networking schemes aid cooperative public policy in changing urban areas. Improved connectivity, for instance, is critical to maximizing the potential economic benefits of agglomeration or helping to offset the loss of it. Moreover, enhanced networking of people and firms fosters innovation as well as the exchange of ideas, goods and services.
- Public-private partnerships allow for innovation, renewal and adaptation of the fiscal bases of cities. The focus of the revitalization efforts in these cities should be on the needs of the disadvantaged segment of the population. Importantly, ensuring voices from such groups are heard and they benefit from the growth and establishment of local anchor institutions rather than be pushed out by the changing conditions (e.g. through gentrification). It is imperative to enhance public participation policies that encourage more engagement from various actors in the planning process.
- Investments in public education and workforce development as well as knowledge transfer and economic diversification can assist regions in moving from outdated economic activities to new businesses and sources of revenue.
- Increasing openness towards external migrants and integrating them into cities as part of a revitalization strategy to counteract for depopulation from outmigration.
- Urban policies should facilitate planning for industrial environmental impacts in the declining phases of cities, and for management of the environmental legacy of industrial activities.
- Flexible design and placement of assets (such as industrial infrastructure, commercial buildings, and infrastructure for water, sewage, electricity and industrial land) facilitate transformation into new uses when necessary. For example, launch a green transformation of abandoned industrial districts into ecological open space or revitalized public space, like a creatively-designed industrial park.
- Issues surrounding the environmental legacy of shrinking cities are a global phenomenon: planners and policymakers need to be aware of the environmental changes that lead to shrinkage as well as the ways in which shrinkage leads to environmental changes. Moreover, pursuing environmental justice presents an opportunity for addressing the decline (i.e., it can form a basis for revitalization).

Source: Chen et al, 2021; Ortiz-Moya, 2020; Silverman, 2018; OECD, 2016; UN-Habitat, 2008; Martinez-Fernandez and Wu, 2007.

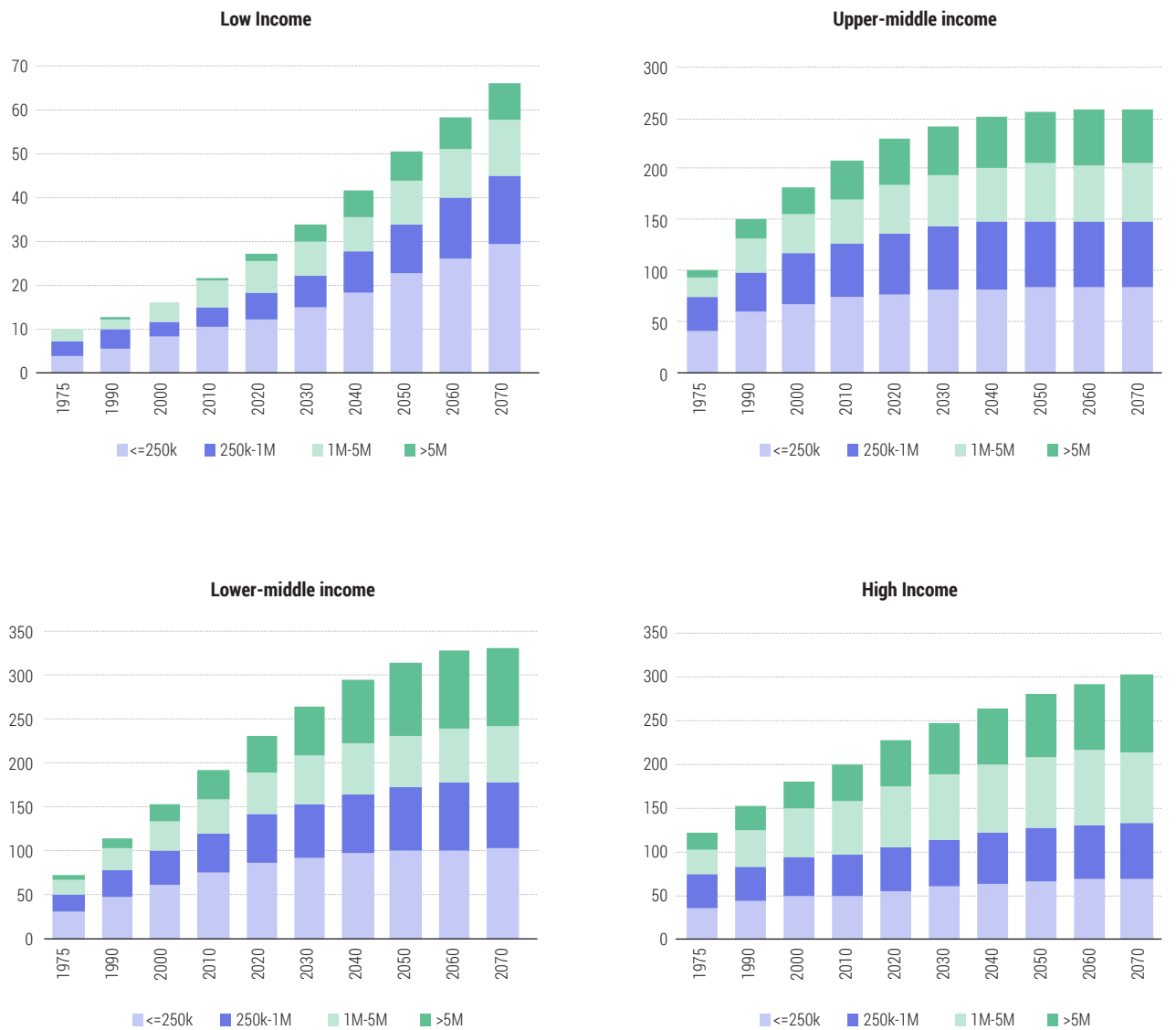
When these changes in city land are observed from the lens of city size and income groups, results show that the lower the income of a country, the higher the share of city land covered by small cities (less than 250,000 inhabitants) (Figure 2.18). In 2020, for instance, almost half of all city land in low-income countries was covered by small cities, compared to around one-third in middle-income countries and one-quarter in high-income countries. By 2070, the share of land in small cities is projected to drop slightly as the land covered by larger cities grows faster. Nevertheless, the big difference between income groups will remain with a far higher share of land covered by small cities in low-income countries (45 per cent) as compared to high-income countries (23 per cent).

This trend essentially implies that small cities— as well as towns and semi-dense areas (as illustrated in Figure 2.6 and Figure 2.7)—remain critical to achieving sustainable

development, especially in low-income countries. It is in these settlements that a variety of urban-rural linkages in production, consumption and financial relationships, have profound impact across the urban-rural continuum are fostered;[42] small cities (and towns and semi-dense areas) essentially enhance synergy within the continuum of human settlements. Therefore, given share of city land covered by these settlements, adequate territorial planning and enhanced capacities in these settlements can strengthen the pivotal role they play as well to help reduce pressure on primary cities in developing regions.

Small cities— as well as towns and semi-dense areas remain critical to achieving sustainable development, especially in low-income countries

Figure 2.18: City land by city size and income group, 1975–2070 (thousand square kilometres)



2.5. Sustainable Futures: How Dense Should Our Cities Be?

The growth of cities both demographically and spatially over the past several decades has highlighted the challenges of managing city growth. UN-Habitat promotes well-planned and designed cities with adequate densities and recommends increasing densities where necessary. The various classes of urban settlements discussed in this chapter can accommodate growth through a mix of strategies, such as densification, mixed-use development, affordable housing, improved connectivity, increased access to public space and a diversity of employment opportunities. These strategies should be underscored by inclusive governance arrangements that promote socially cohesive urban communities.[43]

This section explores and shows the impact of three different city development scenarios on the demand for city land and city population densities in 2050. Density, increasingly seen as a critical sustainability metric, is employed in these scenarios because it is "the intervening measure that translates population into land consumption."[44] The three scenarios are based on the density of cities, towns and semi-dense areas for three different parts of the world (Table 2.2). The biggest differences in density are for cities, a nine-fold increase from the low- to the high-density scenario, followed by towns with a six-fold increase, while semi-dense areas remain very similar across the three scenarios. The population density of a city is critical as it determines how much land is needed to accommodate a given population. In this section, cities with a density below 3,000 inhabitants per sq. km are considered "low density," between 3,000 and 6,000 is considered "medium density," above 6,000 is considered "high density."

In the low-density scenario, a city will tend to grow more horizontally and less vertically. For example, population density would not increase much in the centre of the city and most growth would occur at the edges of the city and at lower densities as illustrated by the case of Maputo, Mozambique, in Figure 2.19. The land covered by the city of Maputo would more than double under all three scenarios. In the low-density scenario, for instance, the land occupied by the city of Maputo would increase by almost 160 per cent, while its population density drops from 6,000 to 5,000 inhabitants per sq. km (see Figure 2.19, top right). Under the high-density scenario, more growth will occur within the initial boundaries of the city, thus increasing density levels, and additional city land will also be relatively high density. Under this scenario, Maputo's land would only grow by 35 per cent, but its population density would double to 13,000 inhabitants per sq. km (see Figure 2.19, bottom right). The medium density scenario leads to a moderate increase in population density and more limited spatial expansion (see Figure 2.19, bottom left).

It worth noting that population growth within the initial boundaries of a city or a town can be accommodated through planned infills or densification by building on vacant land within the town or city, replacing low-rise buildings with medium- or high-rise buildings. Planned city infills can respond to future urban growth in an orderly manner, minimizing expansion through inefficient land-use patterns and leapfrogging that generates wasteful areas as well as avenues for speculation. Infills can also remedy fragmented urban spaces.

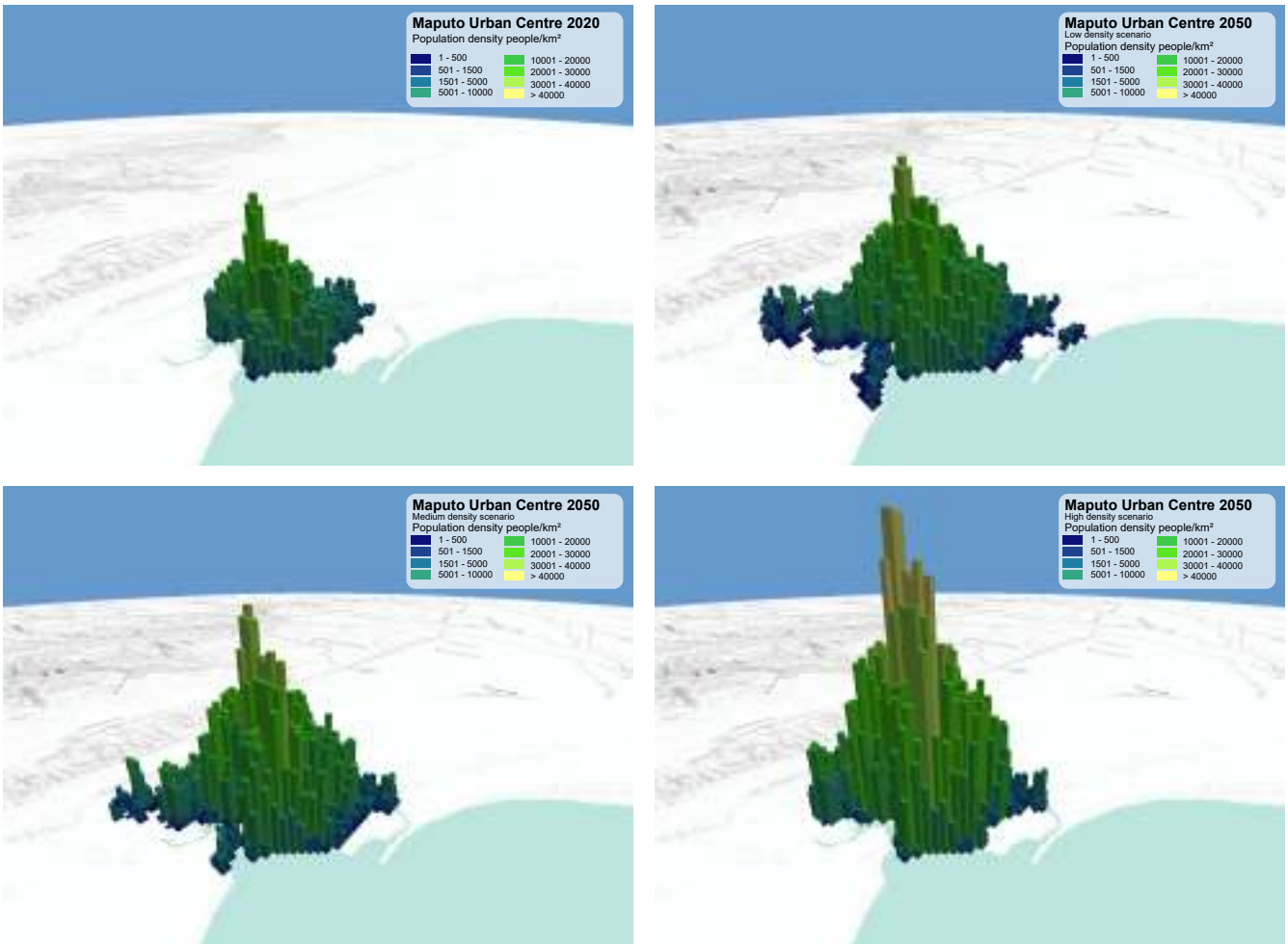
Planned city infills can respond to future urban growth in an orderly manner, minimizing expansion through inefficient land-use patterns and leapfrogging that generates wasteful areas as well as avenues for speculation

These density scenarios play out differently for cities in various regions of the world. Medellín, Colombia—with a very high population density at 16,000 inhabitants per sq. km in 2020—is projected to grow its city's area in the range of 17 per cent and 100 per cent between 2020 and 2050 depending on the scenario. In the low-density scenario,

Table 2.2: Population density in three development scenarios

		Population density in 2015, inhabitants per sq. km		
Scenario	**Based on**	**Cities**	**Towns**	**Semi-dense areas**
Low density	Northern America	1,700	900	750
Medium density	Northern and Western Europe	3,800	1,300	770
High density	Eastern Asia	15,000	5,300	900

Figure 2.19: Maputo in 2020 and in 2050 under three different scenarios



its area would double and its density would drop to 9,500 inhabitants per sq. km, which is still high. The high-density scenario (Figure 2.20) would mean no expansion of city land, but density would further increase to 21,000 inhabitants per sq. km. The medium-density scenario strikes a balance between the demand for land and density with a spatial expansion of only 33 per cent and a small reduction in population density to 14,000 inhabitants per sq. km.

The population of Lusaka, Zambia, is projected to at least double between 2020 and 2050. In the high-density scenario, city land would only increase by 16 per cent, but this scenario doubles its density to 17,600 inhabitants per sq. km. In the moderate density scenario, city land doubles, which keeps population density around 8,700 inhabitants per sq. km. In the low-density scenario, population density drops to 6,300 inhabitants per sq. km, and its area increases by 150 per cent.

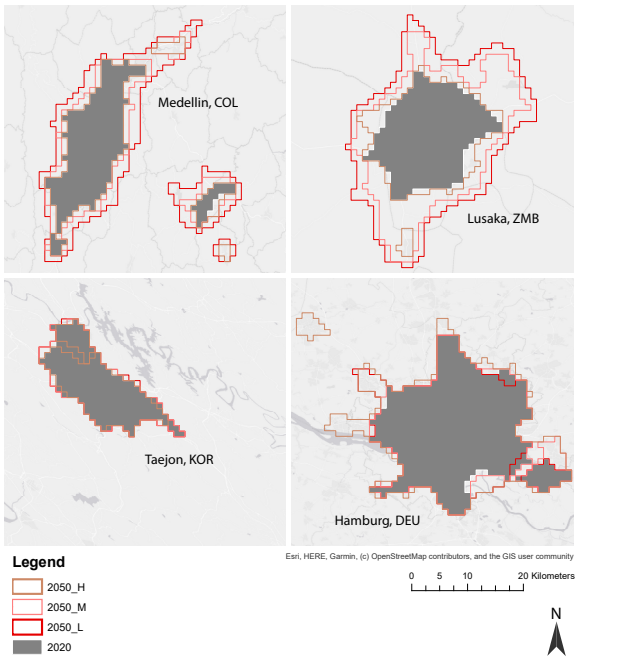
Taejon, Republic of Korea, and Hamburg, Germany, are cities where the impact of the scenarios is far smaller because their populations are not really projected to grow. For Taejon, city land barely increases in the moderate- and low-density scenario, while in the high-density scenario city land shrinks (-23 per cent). In Hamburg, also virtually nothing changes in the moderate- and low-density scenario, but in the high-density scenario Hamburg attracts more residents leading to a growth in population (71 per cent) and in area (31 per cent).

2.5.1. City densities are high and growing in low-income countries

A review of past trends using the harmonized data from the Degree of Urbanization approach shows that cities in low-income countries are among the densest in the world. On average, their density has increased over time from 7,000 to 11,000 inhabitants per sq. km between 1975 and 2015 (Figure 2.21). Cities in lower-middle-income countries had a similar density to that of cities in low-income countries in 1975, but their densities dropped a bit as their cities expanded slightly faster than their populations grew. In 2015, their cities had an average density of about 7,000 inhabitants per sq. km. In upper-middle-income countries and high-income countries, city densities were lower (5,000 and 3,000 respectively) and barely changed over time. These countries experienced slower population growth, which reduced the challenge of providing enough housing and infrastructure.

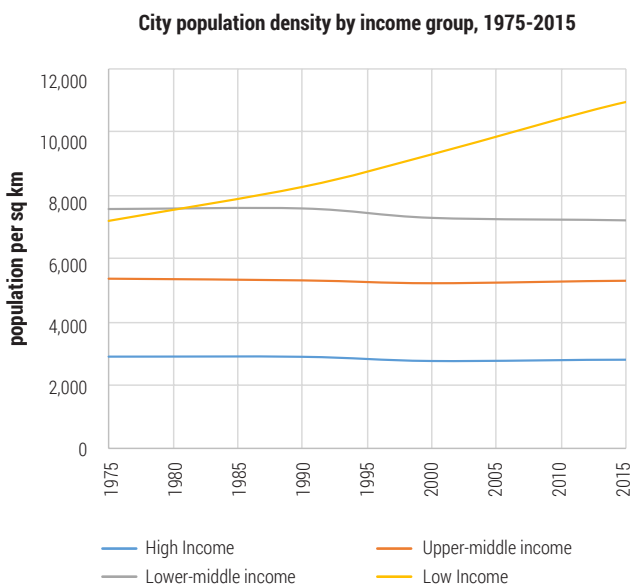
City population density by region shows more variation with the highest densities in Central and Southern Asia, Oceania and Sub-Saharan Africa and the lowest densities in Australia, New Zealand and Northern America (Figure 2.21 and Map 2.2). In most countries, the density increases with the population size of the city, except in low-income countries where on average density does not necessarily increase with population size as smaller cities also tend to be dense.

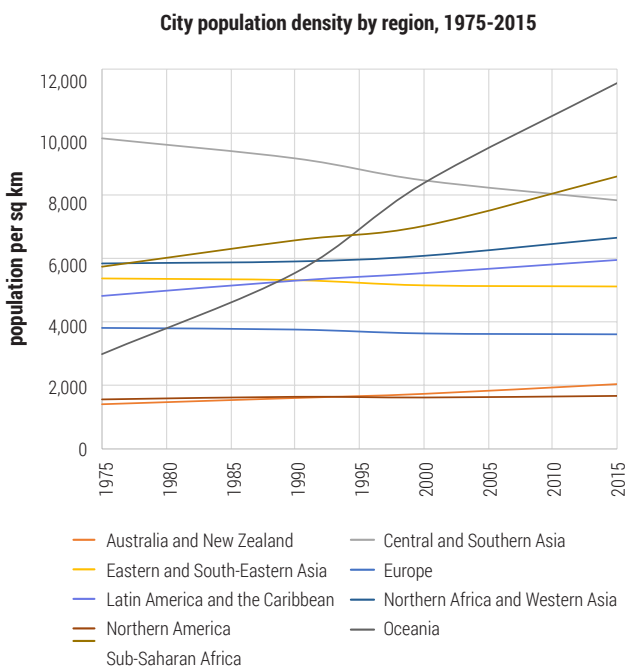
Figure 2.20: City expansion under three development scenarios in Medellin, Lusaka, Taejon and Hamburg



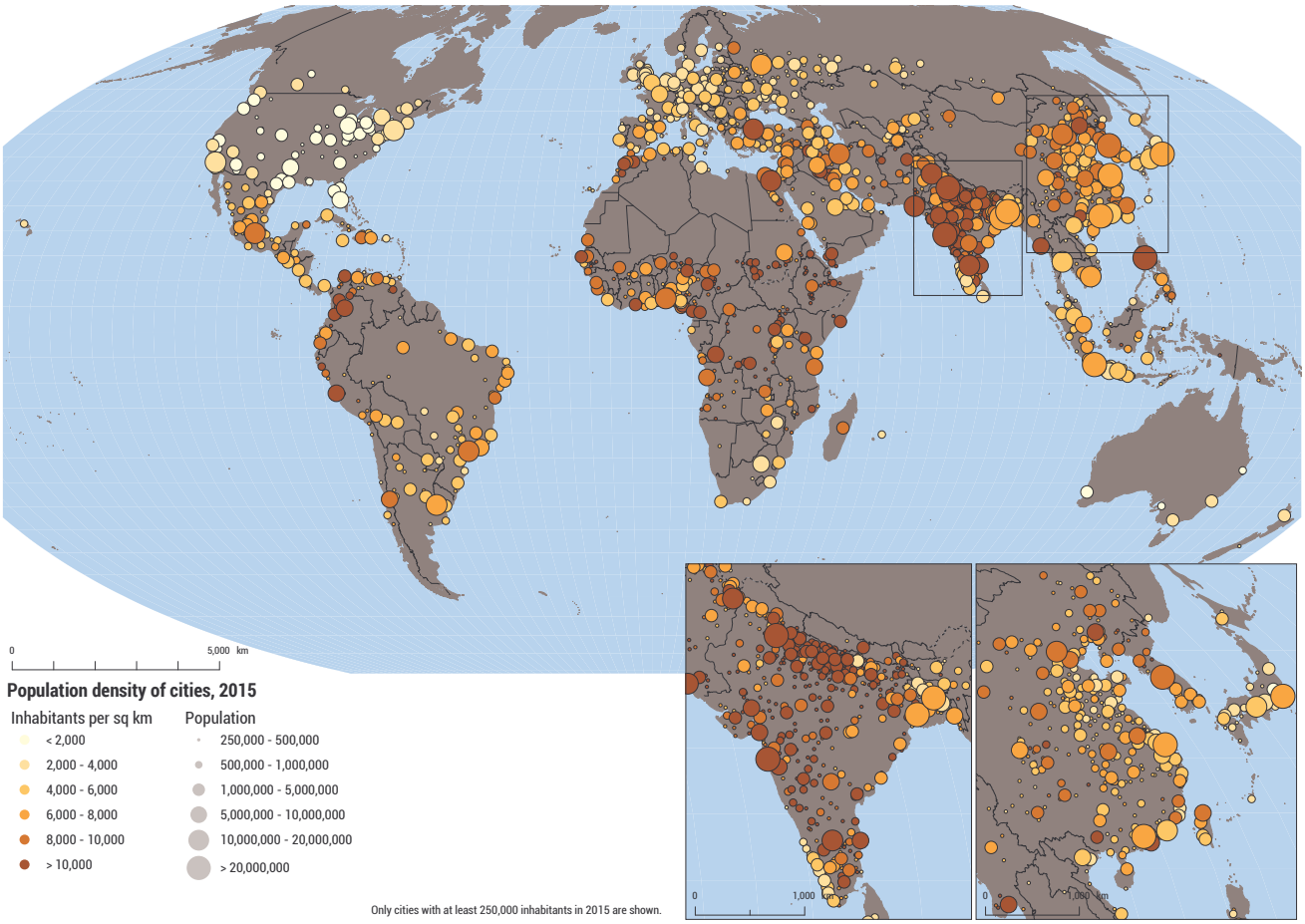
cities in low-income countries are among the densest in the world. On average, their density has increased over time from 7,000 to 11,000 inhabitants per sq. km between 1975 and 2015

Figure 2.21: City population density by income group and region, 1975–2015





Map 2.2: Population density in cities, 2015



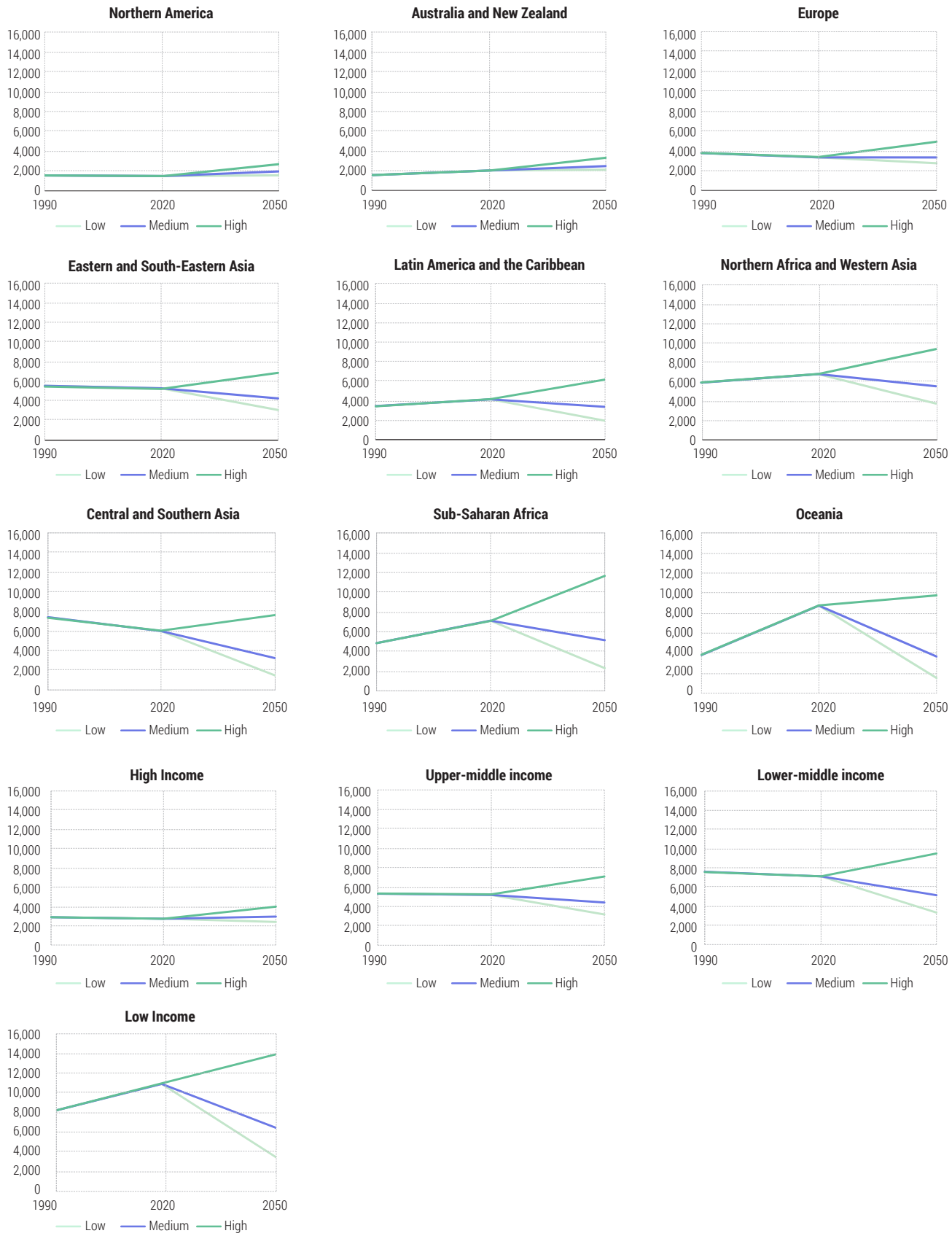
The impact of the three scenarios depends on rate of population growth. The scenarios take into account that it is easier to change the density of new developments than of existing ones. As a result, the biggest impact is on the low-income countries as their population is projected to increase the most (64 per cent between 2020 and 2050), while the population increase in the other income groups is much smaller (ranging from 2 to 29 per cent). For example, city densities would not change dramatically in Northern America, Australia, New Zealand and Europe because their population growth is relatively low (Figure 2.22). By contrast, densities would continue to increase rapidly in Sub-Saharan Africa in the high-density scenario and drop substantially in the low-density scenario.

Under the high-density scenario, population density in cities in low-income countries would continue to increase and reach 14,000 by 2050, while densities in high-income countries would increase the least reaching just 4,000 by 2050. The two middle-income groups would both experience a moderate increase reaching 9,000 in lower-middle-income and 7,000 in upper-middle-income countries (Figure 2.22).

2.5.2. Aiming for adequate densities and managing city expansions

Compact, socially inclusive, better integrated and connected cities are an imperative for sustainable urban futures. As highlighted in previous sections of this chapter and in Chapter 6, the negative social, economic and environmental impacts of dispersed urban growth are significant. On the other hand, compact development reduces sprawl, allows for more efficient use of and preservation of land resources, is associated with lower infrastructure cost per capita, and reduces long commutes (and consequently greenhouse gas emission), among other benefits. For example, transport infrastructure and utilities are more costly to provide and maintain in low-density development scenarios. Efficient

Figure 2.22: Population density in cities in 1990 and 2020 and in three different scenarios in 2050 by income group and SDG region (density in inhabitants per sq. km)



public transport depends on sufficient demand at each public transport stop, which is difficult to provide in low-density neighbourhoods.

Well-designed and contextually supported densification and compact development are important for the various classes of cities discussed in this chapter and are in line with the "optimistic" vision of the future outlined in Chapter 1. Cities should therefore aim for sufficient density with adequate activity mix, while still providing important public amenities such as parks, squares, sports grounds and cultural venues, as well as good transport infrastructure, to ensure connectivity at the city and regional level.[45] These public spaces play a vital role of making density work. The COVID-19 pandemic, for instance, has reinforced the value of quality public spaces, walkability, proximity and enhanced accessibility.[46]

All of these preferences call for responsive urban and territorial planning that anticipates and effectively addresses the demand for city expansion.[47] They also call for the public sector to embrace a fundamental set of actions that will ensure an orderly urban expansion (Box 2.7).[48] On the other hand, however, weaknesses in planning and institutional frameworks will perpetuate sprawl or lead to densification that results in overdevelopment and crowding (and its associated adverse health outcomes), gentrification, poor air quality and noise pollution, among other problems, that make sustainable urban futures elusive and bring to fruition the "high damage" and "pessimistic" scenarios alluded to in the previous chapter.

Globally, cities would occupy less land and host more people under the high-density scenario, but as shown above it would force the already high population density in low-income cities even higher. On the other hand, low-income countries would need five times the amount of land for their cities in the low-density scenario (Figure 2.23). Low-density development would require massive infrastructure investments to provide services and access to all the new neighbourhoods in low-income countries. So many cities would more than double in area under the low-density scenario (Map 2.3) that it would be extremely difficult for governments in lower-income countries to finance the necessary infrastructure. The World Cities Report 2020 already outlined the challenge of financing urban infrastructure in these countries. Still, the moderate- or high-density scenario would imply a tripling or doubling of city land in low-income countries.

In upper-middle- and high-income countries, the growth in city population is lower and cities are less dense. As a result, they can accommodate more people in their cities without any need to increase the amount of land. In some cities, the amount of city land could even shrink (Map 2.4), especially in Eastern Asia.

Box 2.7: Making room for future urban expansion: Minimal actions

In preparing rural areas in the periphery of growing cities for urban development, the public sector should undertake the following fundamental actions:

i estimating the amount of land required for development during the next three decades and identify potential expansion areas;

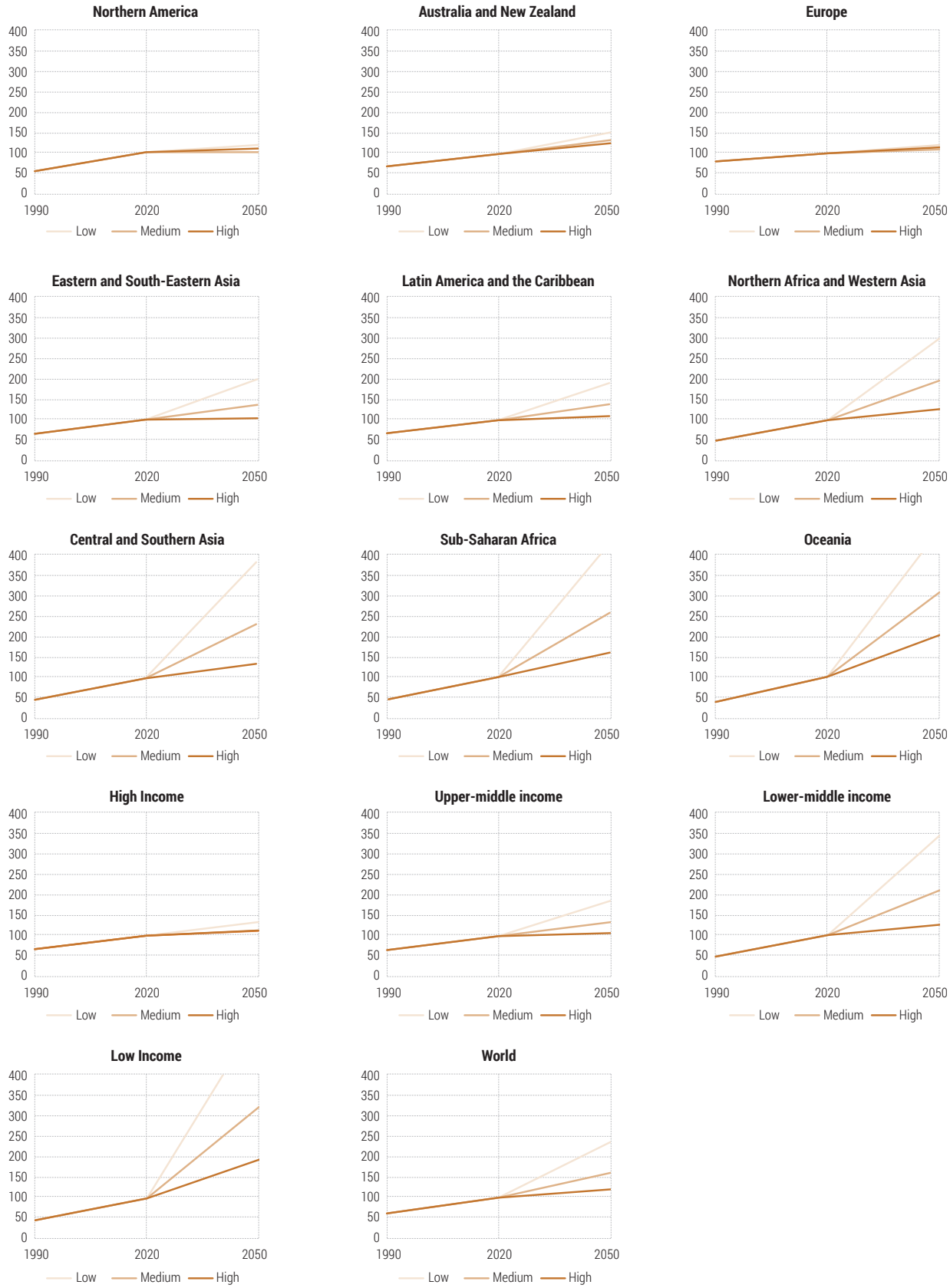
ii protecting areas of environmental risk as well as a hierarchy of public open spaces from development;

iii laying out and securing the rights-of-way for a future arterial infrastructure grid that can carry public transport throughout the projected expansion area; and

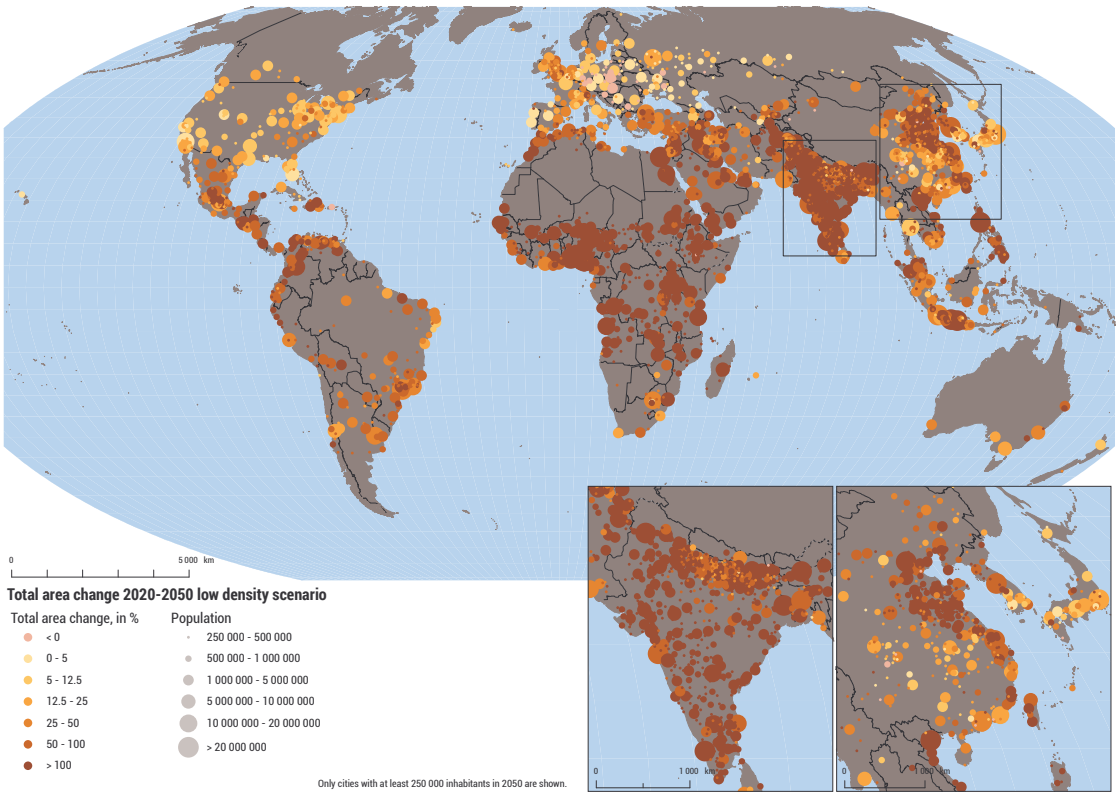
iv fostering the proper subdivision of lands—to rectangular or near-rectangular plots, where possible—by all suppliers of commercial and residential lands, with special attention given to informal housing developers, so as to prevent rural lands converted to residential use from becoming and remaining "slums, "and facilitating their transformation into regular residential neighbourhoods.

Source: Angel et al, 2021.

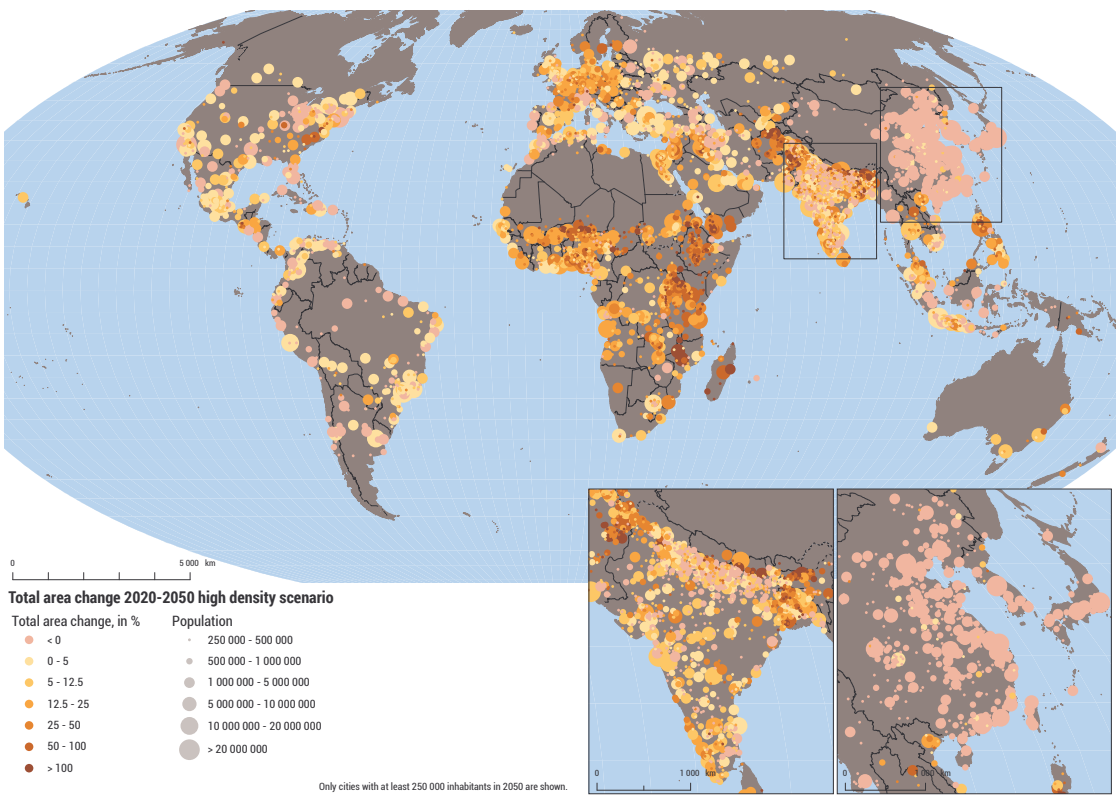
Figure 2.23: City land in 1990, 2020 and in three scenarios in 2050 by income group and SDG region (city land in 2020=100)



Map 2.3: Total area change per city in a low-density scenario, 2020–2050



Map 2.4: Total area change per city in a high-density scenario, 2020–2050



2.6. Concluding Remarks and Lessons for Policy

This chapter, using harmonized data from the Degree of Urbanization approach, shows that the global population share in cities has been increasing continuously, but that the rate of increase has slowed down. About one-quarter of the world population lived in cities (as defined by this approach) in 1950 and this figure grew to almost half the population in 2020. Going forward, a further increase to almost 60 per cent in 2070 is projected. This essentially denotes that the biggest increases in the share of people living in cities is already behind us.

The chapter has further illustrated that city population in low-income countries has been growing much faster than in other countries due to much higher overall demographic growth and a faster increase in the city population share from a low base. As a result of these dynamics, the amount of land covered by cities in low-income countries has grown much faster over the years. It doubled between 1975 and 2020 and is projected to do so again by 2070, a clear indication of the need for policymakers in these countries to focus on managing this spatial growth with sound policies that promote compact development as well as mitigate the negative social, economic and environmental impacts of dispersed urban growth where it is recorded. In contrast, this chapter has also shown that city land in higher-income countries is projected to increase moderately by between 10 per cent and 50 per cent over the same period.

Population growth in cities is primarily driven by natural growth, while rural-to-city migration has a smaller impact. This is especially the case in low-income countries, where natural population growth explains two-thirds of city population growth.

As cities grow, they tend to expand spatially into surrounding suburban and rural areas and to annex nearby towns. This chapter has illustrated that both of these factors contribute to the growth of city population, especially in high-income countries where many cities are surrounded by large suburban areas. In low-income countries, however, the chapter has shown that expansion and annexation adds relatively little to city population growth, in part due to high overall population growth rates and a relative absence of suburban areas.

In terms of various population cohorts, the chapter has shown that the estimated share of children in rural areas tends to be higher than in cities in low-income and lower-middle-income countries. This has been the trend over the past decades, it presently is so, and projection to 2050 shows that it will remain that way. In high-income countries, however, this trend is changing from slightly higher share in rural areas in 1950 to a lower share in rural areas in 2050. The chapter further records that young adults prefer city living across countries within all four income groups, while only in high-income countries do people over 65 move to the rural areas.

The chapter has also vividly shown that concentration of city population in the largest cities tends to be higher in more in more developed countries, when taking into account the population size of a country. Further, it has illustrated that low-income countries have a higher share of their city population and city land in small cities as compared to higher-income countries.

Given the rapid growth of city population in low-income countries, the type of urban development will have a big impact on the shape of cities. For sustainable futures to be realized in these places, policy measures that incentivize compact and moderate- or high-density development—which allow more people to live in cities, while using less land—should be implemented. It is worth noting that significant spatial expansion is inevitable in these countries—even under a higher-density development scenario, city land in low-income countries is projected to double in the 2050s.

Finally, this chapter has emphasized the need for urban and territorial planning that anticipates and responsive to effectively mitigates the negative social, economic and environmental associated with this growth. The growth of city land in low-income countries will require substantial efforts in terms of both planning and infrastructure investments. Planning should be undertaken ahead of this expansion of cities to halt informality and ensure that there is policy coherence at various scales guiding the needed investments. In the absence of this, low-density city development that will see city land in low-income countries increase by a factor of five. This sprawl, compounded by informality, will be extremely challenging to manage, inhibiting the pursuit and realization of sustainable futures.

Endnotes

1. EU, FAO, ILO, OECD, UN-Habitat and the World Bank.
2. European Union et al, 2021.
3. National Research Council, 2003.
4. GHS-POP (https://ghsl.jrc.ec.europa.eu/ghs_pop.php); Applying this to other global population grids such as World Pop will produce slightly different share, but the overall pattern remains the same. www.worldpop.org
5. Dijkstra et al, 2021.
6. UNDESA, 2001.
7. Montgomery, 2008.
8. Lutz et al, 2018; UNDESA, 2019c; Vollset et al, 2020.
9. Bocquier and Costa, 2015; De Vries, 2013; Dyson, 2011; Zelinsky, 1971.
10. UNDESA, 2001; Dyson, 2011; Stecklov, 2008; Davis, 1965.
11. UN-Habitat, 2016a.
12. UN-Habitat, 2020a.
13. Brückner, 2012; Barrios, Annez, P., R. Buckley and J. Kalarickal, 2010; Bertinelli and Strobl,2006; Fay and Opal, 1999.
14. Resource-rich coastal cities, urban atoll islands, densely populated deltas and Arctic communities are most threatened (IPCC, 2022b); in some countries (e.g. China) the expansion of cities in coastal and delta regions has been notable (McGranahan et al, 2007).
15. UNDESA, 2019b.
16. Fuller and Romer, 2014.
17. UNDESA, 2019c.
18. UNECOSOC, 2019; UN-Habitat, 2019a; Lincoln Institute of Land Policy, 2016.
19. UN-Habitat, 2018b.
20. This section only provides a global overview. It is worth noting that not all cities are experiencing population growth; some are experiencing shrinkage. Subsequent sections of this chapter, Chapter 1 and previous UN-Habitat flagship reports highlight this phenomenon.
21. Farrell, 2017; Farrell, 2018; Farrell and Westlund, 2018; Menashe-Oren and Stecklov, 2017; Montgomery, 2008; Stecklov, 2008.
22. Menashe Oren and Bocquier, 2021.
23. Jiang et al, 2021; Jones et al, 2020.
24. Roberts, 2014.
25. UNICEF et al, 2020.
26. European Commission and LSE, 2000.
27. Rogers et al, 2002.
28. Bloom et al, 2003.
29. Urdal and Hoelscher, 2009.
30. UN-Habitat, 2008.
31. Glaeser, 2014.
32. First, the population of each city is expressed as a share of the total city population. Second, each of those shares is squared. Finally, these squared shares are summed. High numbers indicate high primacy.
33. Henderson, 2000.
34. UN-Habitat, 2021a.
35. UNDESA, 2019b.
36. UN-Habitat, 2020a; UN-Habitat, 2020b; UN-Habitat 2010.
37. Mudau et al, 2020.
38. Agyemang et al, 2019; Yiran et al, 2020; UN-Habitat, 2009.
39. UN-Habitat, 2008.
40. UN-Habitat, 2008.
41. Ortiz-Moya, 2020; City of Kitakyushu and Institute for Global Environmental Strategies, 2018.
42. UN-Habitat, 2020a.
43. UN-Habitat, 2019b.
44. Angel et al, 2020.
45. UN-Habitat recommends a minimum of 15,000 inhabitants per square kilometre (UN-Habitat, 2014).
46. OECD, 2020b.
47. UN-Habitat, 2014.
48. Angel et al, 2021.

Chapter 3:

Poverty and Inequality: Enduring Features of an Urban Future?

Quick facts

1. Urban poverty and inequality are highly complex and multidimensional challenges whose manifestation go beyond lack of income.

2. Without concerted action at all levels, poverty and inequality could become the face of the future of cities.

3. Poverty is on the rise in close to one-third of the countries in Sub-Saharan African, and most countries in the region are off-track in ending poverty by 2030.

4. The COVID-19 pandemic has reversed years of remarkable progress made in the fight against poverty and has resulted in the emergence of newly poor people.

5. The level of urban poverty and inequality, coupled with the impacts of the COVID-19 pandemic are clear indicators that governments must act now to create the conditions that nurture equitable urban futures.

Policy points

1. The vision of equitable urban futures will not be achieved unless cities and subnational governments take bold actions to address the pervasive presence of urban poverty and inequality.

2. Within the Decade of Action window (2020–2030), cities and subnational governments should adopt a multidimensional approach to addressing poverty and inequality.

3. Investing in and extending infrastructure and services to deprived neighbourhoods is a critical policy lever to address poverty and inequality

4. Supporting informal employment is critical for building inclusive urban futures.

5. Gender transformative approaches are crucial for building inclusive urban futures.

Urban poverty and inequality remain one of the most intractable and highly complex problems confronting cities. The notoriously overcrowded slums in Mumbai, India; Nairobi and Rio de Janeiro; chronic homelessness in London; and persistent concentrated poverty in Baltimore, US, all send one clear message to policymakers: tackling urban poverty and inequality is one of the key priorities for building inclusive and equitable urban futures. The SDGs and the New Urban Agenda are bold, ambitious, multi-stakeholder frameworks that have been adopted to tackle poverty and inequalities and develop cities in an inclusive manner. Both frameworks recognize the transformative power of cities in promoting equitable growth and prosperity.[1] Specifically, target 11.1 of SDG 11 seeks to ensure access to affordable housing and basic services for all by 2030. The New Urban Agenda envisions cities as centres of equal opportunities, where everyone enjoys productive and prosperous lives. Both SDGs and the New Urban Agenda are underpinned by the principle of leaving no one behind. Urban groups that are often marginalized include women, children, the homeless, migrants and refugees, minorities, indigenous people, people with disabilities and those working in the informal economy. These groups are systemically excluded from the opportunities and benefits of urbanization based on gender, age, race, ethnicity and other characteristics.

The solutions to creating inclusive and equitable urban futures are more likely to come from the decisions of local governments. Cities have several unique characteristics to attain the principles embedded in sustainable development. The process of urbanization has the potential to become a transformative force that creates opportunities for all. Properly planned and well-managed urbanization processes can reduce poverty and inequality by creating employment opportunities as well as ensuring access to infrastructure and basic urban services, especially for the most vulnerable. Conversely, poorly planned urbanization can be a key driver of and catalyst for urban poverty, inequality, social exclusion and marginalization. Without concerted action at all levels, poverty and inequity might become enduring features of the future of cities.

Despite the aspirations embedded in international development frameworks, cities are characterized by both visible and invisible divides that often trigger various forms of social, economic and political exclusion. The Kuala Lumpur Declaration on Cities 2030 rekindled these concerns by highlighting key challenges facing our cities. These include inequitable access to urban services and economic opportunities, insufficient protection of the urban poor from forced evictions and exclusion of the poor in urban planning processes.[2] Cities have become arenas of contestation between different interests. Elites are increasingly concentrating economic and political power in ways that manifest spatially. Thus, despite being incredible generators of economic growth and well-being, cities are potentially poverty and inequality traps. More than ever, increasing levels of poverty and inequality are becoming persistent trends in our towns and cities.[3]

The COVID-19 pandemic has exacerbated existing urban inequalities and amplified vulnerabilities, with disproportionate impacts on disadvantaged groups. The pandemic, along with the looming climate crisis, current socioeconomic and political instabilities, and persistent armed conflict, create significant challenges for building inclusive and sustainable urban futures. The pandemic is a vivid reminder that the vision of inclusive and equitable urban futures can be nurtured or suppressed in cities. Therefore, the key questions for policymakers are: what will the future of cities look like with respect to urban poverty and inequality, and how will these realities play out in different geographical settings? Though the future cannot be predicted with certainty, what happens in cities today will determine the nature of poverty and inequality for years to come.

This chapter examines the outlook for poverty and inequality in the future of cities. As a prelude, the chapter introduces the multidimensional nature of urban poverty and inequality and how they manifest in different geographical settings, urbanization trends, shifting modes of production, changing political economies, and local and national policies. It analyses the current situation with respect to urban poverty and inequality in different geographical contexts and discusses how cities can respond to the underlying challenges of poverty and inequality to ensure that no one is left behind amid multiple crises. Urban poverty and inequality trends differ significantly between cities of developed and developing countries, which reflects the reality of a highly unequal urban world. The chapter explores the future roles of cities and subnational governments in eradicating poverty and inequality and discusses how slums and informal settlements can act as entry points for place-based interventions to build resilience. Finally, the chapter examines transformative approaches for addressing poverty and systemic inequalities as a basis for sustainable and inclusive urban futures. These approaches will help determine which of the scenarios of urban futures discussed in Chapter 1 will come to pass.

3.1. Urban Poverty and Inequality: A Multidimensional Perspective

Urban poverty and inequality are some of the most persistent problems confronting cities today and will likely continue to do so for many years to come without significant intervention. These deprivations presently occur at a larger scale in cities due in part to the fact that majority of the world's population resides in urban areas. The COVID-19 pandemic has exacerbated these challenges, creating more challenges for cities and subnational governments. Figures 3.1 and 3.2 represent the multiple dimensions of urban poverty and inequality, respectively, as they manifest in cities.

3.1.1. The complexity and multidimensionality of urban poverty

As shown in Figure 3.1, urban poverty is complex and multidimensional. Income-based measures of urban poverty are inadequate as they do not account for its multiple dimensions. Relying entirely on income-based indicators is overly simplistic because it implies that the income required to address poverty is the same in every geographical context. This view does not reflect the multiple deprivations that urban inhabitants experience. The multidimensional perspective to urban poverty is important as it informs the design of policy interventions to enhance human well-being in other facets rather than just income. For example, incomes for urban households might appear high until factoring in the deprivation of basic services (housing, water, sanitation, energy), which places additional economic burden on households, especially in slums and informal settlements where the majority of the poor live.

Urban poverty and inequality are some of the most persistent problems confronting cities today

In cities of developing regions, slums and informal settlements are the most enduring faces of poverty.[4] Residents of slums and informal settlements experience one or more of the following deprivations: lack of access to improved water and sanitation facilities; overcrowded and precarious housing conditions and location; voicelessness and powerlessness in political systems and governance processes; and lack of tenure security (Figure 3.1).[5] These deprivations are also amplified by what could be called a "poverty of urban planning," or

Figure 3.1: Multidimensional nature of urban poverty

approaches to the built environment that do not improve the livelihoods of the poor. For instance, in the Pakistani cities of Karachi and Lahore public funds have been diverted to large-scale infrastructure projects to the detriment of smaller-scale, pro-poor development proposals.[6]

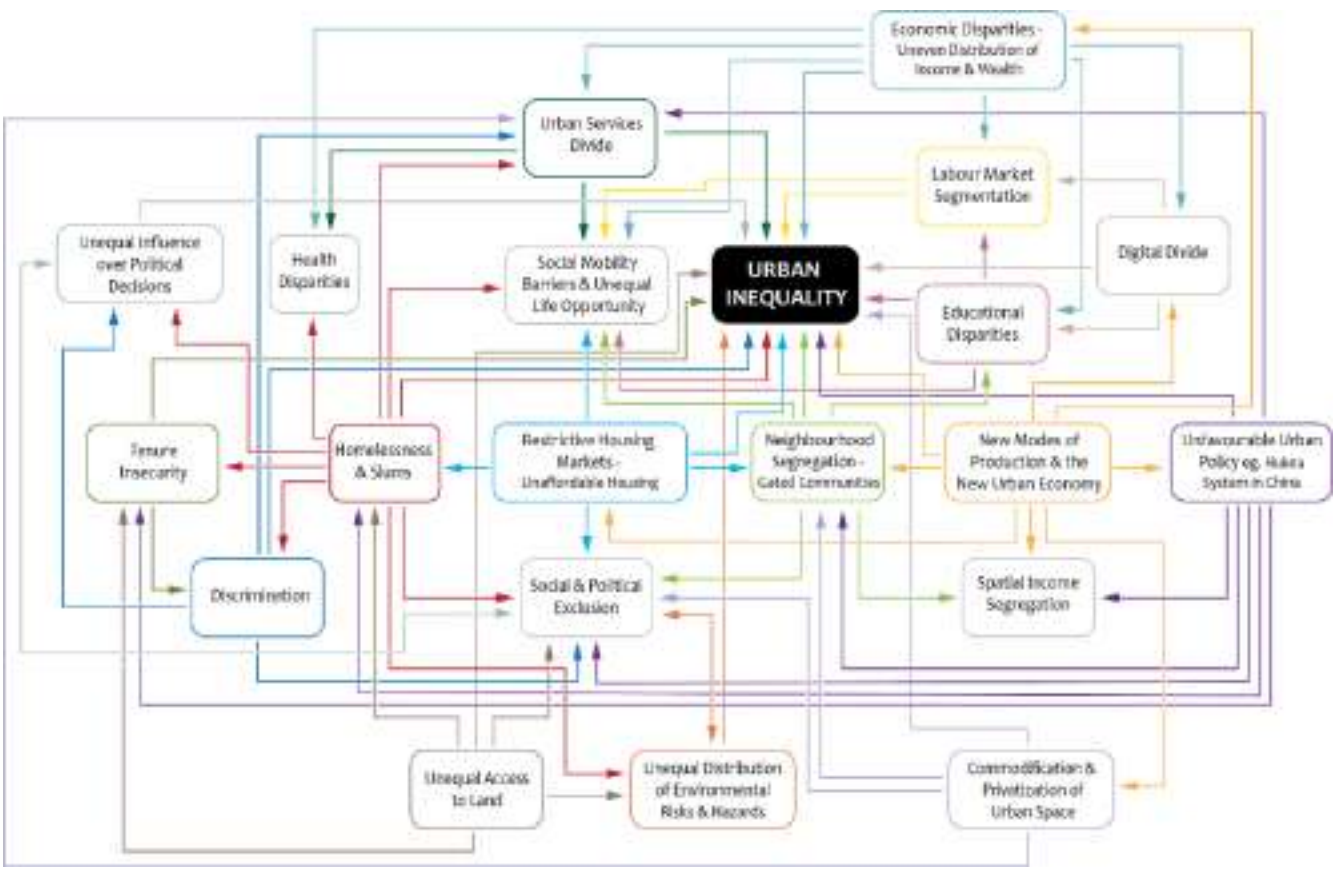
The urban poor living in slums are heterogenous groups with different levels of vulnerability based on gender, age, ethnicity, race, household structure, migration status and other intersectional factors. Urban poverty has social, economic, environmental and spatial dimensions, and its manifestation differs from place to place. The various dimensions shown in Figure 3.1 are not isolated; they interact and reinforce each other to create, recreate and entrench urban poverty. This conceptualization allows us to see urban poverty as entailing a web of deprivation, a crisscrossing of circumstances that create conditions trapping millions in zones of concentrated deprivation with limited opportunities for upward social mobility. Without collective action, the multiple dimensions of urban poverty could become more complicated and generate cumulative vulnerabilities and deprivations that will be difficult to reverse or rectify.

3.1.2. The multiple faces of urban inequalities

Urban poverty and inequality are interrelated in different ways. Figure 3.2 shows that urban inequality is also multidimensional and highly complex. Like poverty, urban inequality has economic, social and spatial manifestations. Urban inequality is marked by differential access to income and wealth, urban services and infrastructure, technology, public health, social protection, education, social protection, public spaces, decision-making structures and environmental burdens, among others.

The current models of urban development in cities of both developed and developing regions are driven by massive capital accumulation, hyper-commodification and privatization of urban spaces, thereby escalating urban inequalities.[7] As shown in Figure 3.2, the "new urban economy" represented by these new modes of production produce and reproduce equalities. The restrictive housing policies prevalent in cities today generate material and symbolic conditions that marginalize and exclude certain groups of the urban population. Moreover, the consumer-oriented urban economy in cities has created diverse

Figure 3.2: Complex web of multidimensional urban inequalities: drivers and outcomes



geographies of urban inequalities in cities of developed and developing countries, albeit at different scales.

The unequal production and consumption of urban spaces results in significant disadvantage being concentrated in certain places rather than others. For example, the new urban economy promotes the emergence of privatized residential enclaves where the rich enjoy superior infrastructure and services while the urban poor are relegated to deprived neighbourhoods reliant on underfunded public goods. These deprived neighbourhoods have poor quality infrastructure and municipal services, and their residents bear the brunt of education disparities, health disparities, socioeconomic and political exclusion, territorial stigmatization and discrimination.[8] The resulting patterns are disjointed, fragmentated and unsustainable urban geographies of inequality and human suffering where a society of wealthy islands are surrounded by a sea of poverty. A prime example is the Eko Atlantic City in Nigeria—a private city being built in Lagos adjacent to the highly deprived and impoverished Makoko slum.[9] In cities of developed countries, spatial segregation of social groups results in differential access to employment opportunities, healthcare and social services, often along racial or ethnic lines.

The various dimensions of urban poverty and inequality explained above are not new; they have always been a pervasive feature of cities. However, poverty and inequality are created, recreated and amplified based on trends in the global economy and external shocks and stresses, which often lead to added layers of new vulnerabilities. For example, the COVID-19 pandemic has exposed some of the hidden pockets of poverty and inequality in cities of both developed and developing countries; deepened already existing disparities; and reversed declines in global poverty, which is indicative of the pessimistic scenario of urban futures discussed in Chapter 1. These events create additional challenges for cities and subnational governments as they struggle to build equitable, inclusive and sustainable urban futures under conditions of high uncertainty.

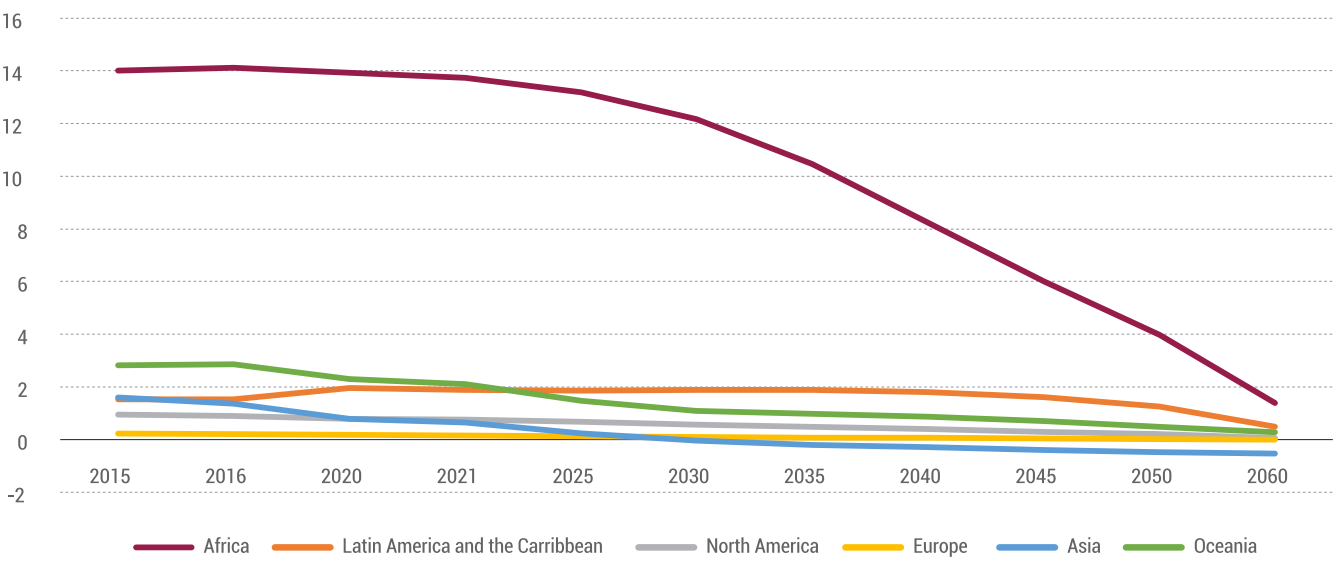
3.2. Trends in Poverty and Inequality: Implications for Urban Futures

This section discusses the current trends on urban poverty and inequality and implications for inclusive and equitable urban futures. The first part gives a global overview on poverty and inequality trends while the second part analyses trends at the local level in both developed and developing regions.

3.2.1. A global overview of poverty trends

Over the past several decades before the COVID-19 pandemic, there has been steady progress in the fight against extreme income poverty globally. Official estimates suggest that the number of people living in extreme poverty (living on less than US$1.90/day) has been declining; between 1990 and 2015, close to 1.2 billion people were pulled out of extreme poverty.[10] By 2018, three years after the adoption of the SDGs, the proportion of people living in extreme

Figure 3.3: Extreme poverty rates by region in a no COVID-19 scenario



Source: Data generated from Frederick S. Pardee Center for International Futures, 2022.

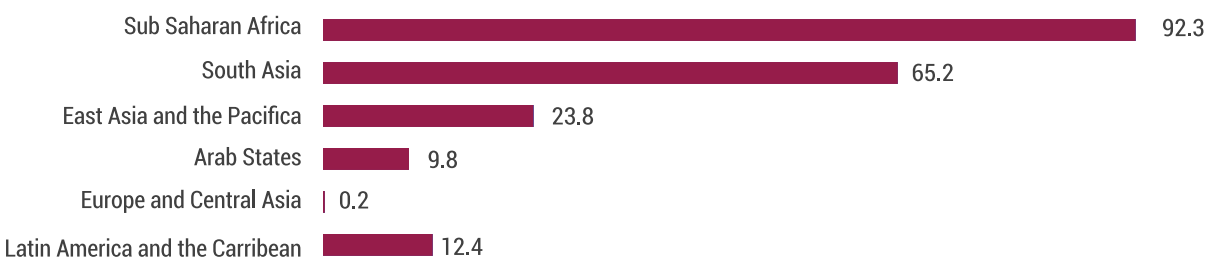
Homeless man in Rio de Janeiro, Brazil © Shutterstock

poverty had decreased from 10 to 8.6 per cent. Based on historic trends, extreme poverty was projected to decline to 6 per cent by 2030,[11] which is still above the SDG target of less than 3 per cent of the population. Before COVID-19, the number of people living in extreme poverty was expected to decline; falling to 672 million by 2030 and to just over 400 million by 2050.[12]

There are regional variations in global poverty dynamics. Currently, more than 90 per cent of the poor live in low-income and middle-income countries. High-income countries have already met the SDG target of reducing extreme poverty to less than 3 per cent of the population, though many upper-middle-income countries are yet to meet the target at the country level. In lower-middle-income countries the poverty rate before the COVID-19 pandemic in 2019 was just under 12 per cent of the population (358 million) and in low-income countries it was 45 per cent (329 million).[13]

Figure 3.3. shows poverty trends by regions. Though poverty has been declining in Africa since 2015, the continent still faces significant challenges in meeting the SDG target of eradicating poverty in all its forms. Many African countries face serious challenges due to fragile economic and political circumstances like armed conflicts and dependency on commodity exports. These conditions are compounded by governments' inability to provide adequate infrastructure, services and employment to pull people out of poverty. Other regions—Europe, Asia, Oceania, Northern America, and Latin America and the Caribbean—have been doing

Figure 3.4: Urban population of multidimensionally poor (millions)



Source: UNDP and Oxford Poverty and Human Development Initiative, 2020.

relatively well under the no COVID-19 scenario. In Northern America, Europe and Oceania, effective programmes and egalitarian policies enable governments to provide basic infrastructure and services, including targeting the poor.

3.2.2. The unfinished business in the fight against global poverty

The fight against poverty is part of the unfinished business of the global development agenda. Current projections suggest that the number of people living in extreme poverty will remain above 600 million in 2030, resulting in a global poverty rate of 7.4 per cent.[14] Multidimensional poverty in developing countries remains high. Research conducted in 107 developing countries revealed that 1.3 billion people[15] or 22 per cent of the population are multidimensionally poor.[16] Current estimates suggest that about 84.3 per cent of the multidimensionally poor live in Sub-Saharan Africa (556 million) and Southern Asia (532 million), while about 67 per cent are in middle-income countries. About 200 million of the 1.3 billion multidimensionally poor people reside in urban areas[17] with the regional breakdown shown in Figure 3.4.

The COVID-19 pandemic is reversing development gains made in the fight against global poverty. The pandemic has increased poverty and made achieving the SDGs even more urgent. Projections suggest that globally, COVID-19 likely pushed between 88 and 115 million people into extreme poverty in 2020.[18] The pandemic has resulted in the emergence of "newly poor" people—that is, those who would have exited poverty in the absence of COVID-19 but are now projected to remain poor as well as those projected to fall into poverty because of the pandemic.[19] In 2020, between 119 and 124 million people were projected to enter the global ranks of the new poor; this number was projected to rise to between 143 and 163 million in 2021.[20] Many of the new poor will be living in urban areas[21]; presenting an additional burden for cities and subnational governments that are already overwhelmed.

3.3. A Global Snapshot of Inequality Trends

Over the last decade there has been steady progress in reducing global inequality. The Gini index fell in 38 out of 84 countries between 2010 and 2017.[22] Income gaps between countries have also improved in the past 25 years, suggesting that average incomes in developing countries are increasing at a faster rate. Very big economies like China and India have a large share of the world's population and their development trajectories have greatly influenced global inequality.[23] However, some regions still record high levels of income inequality. For instance, Latin America and the Caribbean is one of the most unequal regions in the world, where income and wealth is concentrated in the richest top 10 per cent of individuals. Countries like Brazil, Honduras, Colombia, Panama and Guatemala remain at the top of regional and global inequality rankings.[24] Brazil's inequality statistics are staggering; the country's six richest men control as much wealth as the bottom half of the population. Oxfam notes that current reduction rates, it will take 75 years for Brazil to reach the current level of income equality in the UK and almost 60 years to meet that of Spain.[25]

Latin America and the Caribbean is one of the most unequal regions in the world

Inequalities between developed and developing regions remain large. For example, the average income of people living in North America is 16 times higher than Sub-Saharan Africa.[26] South Africa remains one of the most unequal countries in the world, where the poorest 40 per cent have annual incomes of less than US$1,000 per person, while the richest 10 per cent earn more than US$39,000 per person—which is nearly 40 times higher than those at the bottom 40 per cent.[27] The top 10 per cent in South Africa hold 80.6 per cent of all financial assets; the rates in Botswana and Namibia are 61.2 per cent and 65.5 per cent, respectively.[28] Such alarming levels of income inequality result from massive wealth gaps between the rich and the poor. This disparity has been amplified by the economic impacts of the COVID-19 pandemic, which could further undermine the prospects for inclusive and equitable growth, leading to the high damage or pessimistic scenarios outlined in Chapter 1. Despite the existence of universal welfare systems and social protection systems, inequality in developed regions, particularly in Northern America and Oceania, has been increasing, with the rich getting richer while the socioeconomic progress of the poor remains limited.[29] In the US, unequal distribution of income and wealth has reached astronomical levels; where over 20 per cent of the country's wealth belongs to the top 1 per cent.[30]

In addition to income inequalities, there are also gaps in access to basic services and opportunities. The ongoing global housing affordability crisis means that slums and informal settlements are the only housing option for millions of low-income households in developing countries. Currently, about

1.6 billion people or over 20 per cent of the global population live in inadequate, crowded and unsafe housing. Another two billion people are expected to be living in slums in the next 30 years, which represents roughly 183,000 people each day.[31] More than 90 per cent of urban residents living in slums are located in poor countries.[32] Although slums and informal settlements are characteristics of cities in low- and middle-income countries, some cities in developed countries are also experiencing inequalities in housing. London, for example, has experienced an appalling surge in homelessness because of restrictive urban housing markets.

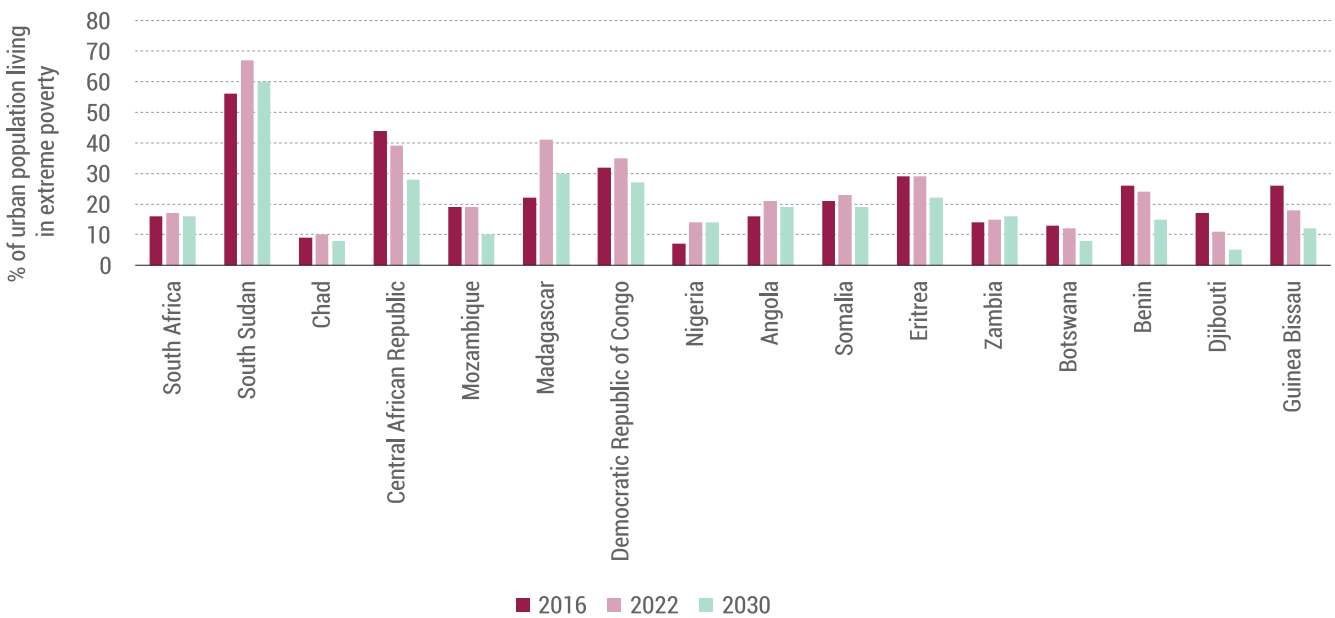
Globally, there is a growing divide in access to basic services. Developing countries have larger proportions of their populations with limited access to basic water and sanitation as shown in Chapter 1. About 70 per cent of the urban population in developing countries is currently underserved by municipal services. About half of the population in 15 major cities lack access to piped water while 64 per cent rely on unsafely managed sanitation, which exposes them to various health and environmental hazards.[33] In some of the poorest countries, the difference in access to drinking water between the richest and the poorest households in urban areas was 59 percentage points in 2017.[34] Between 2000 and 2017, urban population growth exceeded the total number of people gaining at least basic sanitation services in Sub-Saharan and Oceania.[35] The above trends manifest spatially in cities of both developing and developing regions.

3.4. Urban Poverty in Developing Regions: Trends and Challenges for the Future of Cities

As the world becomes increasingly urbanized, poverty is shifting from rural areas to towns and cities—a phenomenon described as the "urbanization of poverty." Urban areas, especially those in developing countries, are experiencing a remarkable increase in the number of people living in extreme income poverty, with vulnerable groups bearing the brunt. Figure 3.5 shows the proportion of people living in extreme poverty in urban areas of selected Sub-Saharan African countries.

Since 2016, South Sudan, Central African Republic, Democratic Republic of the Congo and Eritrea have seen more than 20 per cent of their urban population living in extreme poverty. These high rates are projected to remain so in 2030, thereby making the target of eradicating extreme poverty in all its forms unattainable. Current estimates suggest that by 2030, over 60 per cent of those living in extreme poverty will be in fragile states.[36] Urban poverty in South Sudan, Central African Republic and Democratic Republic of the Congo is exacerbated by social, economic, political and environmental fragility coupled with weak institutions to deliver public services such as health, education, water and sanitation and social protection capable of eradicating poverty. Indeed, the 2021 Fragile States Index for South Sudan, Democratic

Figure 3.5: Percentage of urban population living in extreme poverty in selected Sub-Saharan African countries (2016–2030)



Source: World Data Lab, 2022

Republic of the Congo and Central African Republic are 109.4, 108.4 and 107.0, respectively. All three countries are ranked in the top 10 of the world's most fragile states.[37]

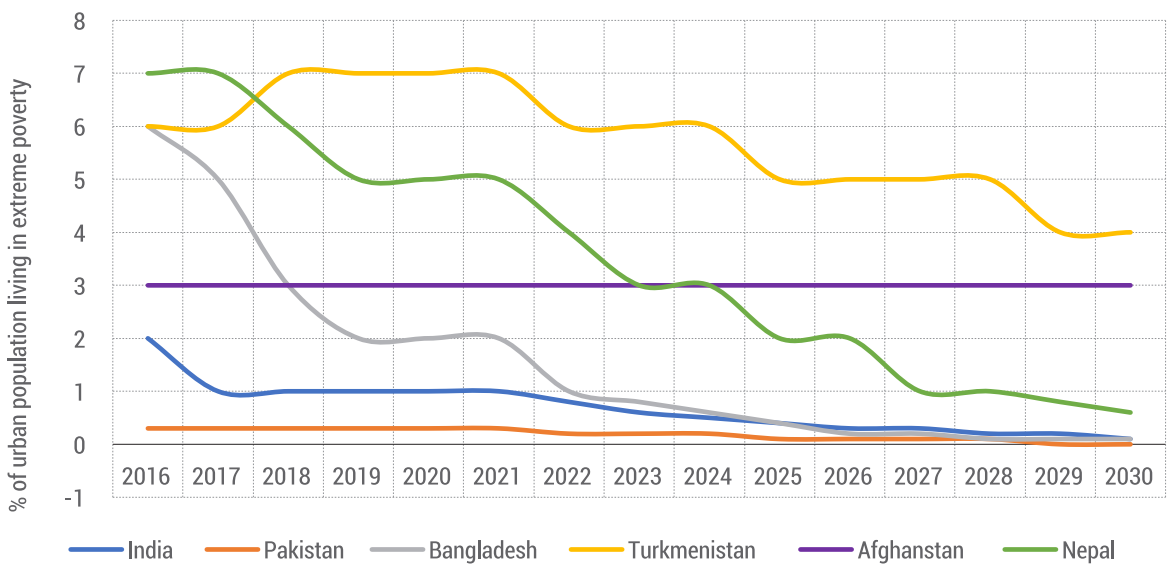
The current trends show that most countries in Sub-Saharan Africa are off-track in achieving the goal of ending poverty by 2030. The region has the highest incidence of urban poverty globally with about 23 per cent of the urban population living below the international poverty line and 29 per cent experiencing multidimensional poverty.38 A recent study of 119 countries (representing 45 per cent of the world's population) reveals that the rate of multidimensional urban poverty in Sub-Saharan Africa is 11 times higher than in Latin America and the Caribbean.[39] Indeed, poverty is on the rise in close to one-third of the countries in Sub-Saharan African.[40] Unless governments at all levels take concerted measures to act now, poverty will become endemic features of cities for several years to come in Sub-Saharan Africa.

In Asia, in the last two decades, China and India experienced rapid economic growth and urbanization, which led to a massive reduction in the number of people living in poverty. Over the years, China's poverty reduction efforts have largely focused on broad-based economic transformation and targeted support for vulnerable households to alleviate persistent poverty.[41] This has resulted in more than 800 million people being lifted out of poverty. Figure 3.6 shows the proportion of the urban population living in extreme poverty in selected Asian countries. Current trends demonstrate that most countries in Asia are on track to end poverty by 2030, while some may fail to achieve this goal. For example, in Southern Asia, Afghanistan may fail to achieve SDG 1 targets because of growing socioeconomic and political fragilities, which undermine the fight against extreme income poverty.

Despite the economic gains and low levels of income related urban poverty in Asia, there are significant regional variations. In Japan for instance, spatial concentration of poverty in specific areas has deepened in the megacity regions of Tokyo and Osaka.[42] This is the situation in most megacities in South Asia, such as Dhaka, Bangladesh, where the spatial concentration of deprivation is embedded in the daily lives of the urban poor.

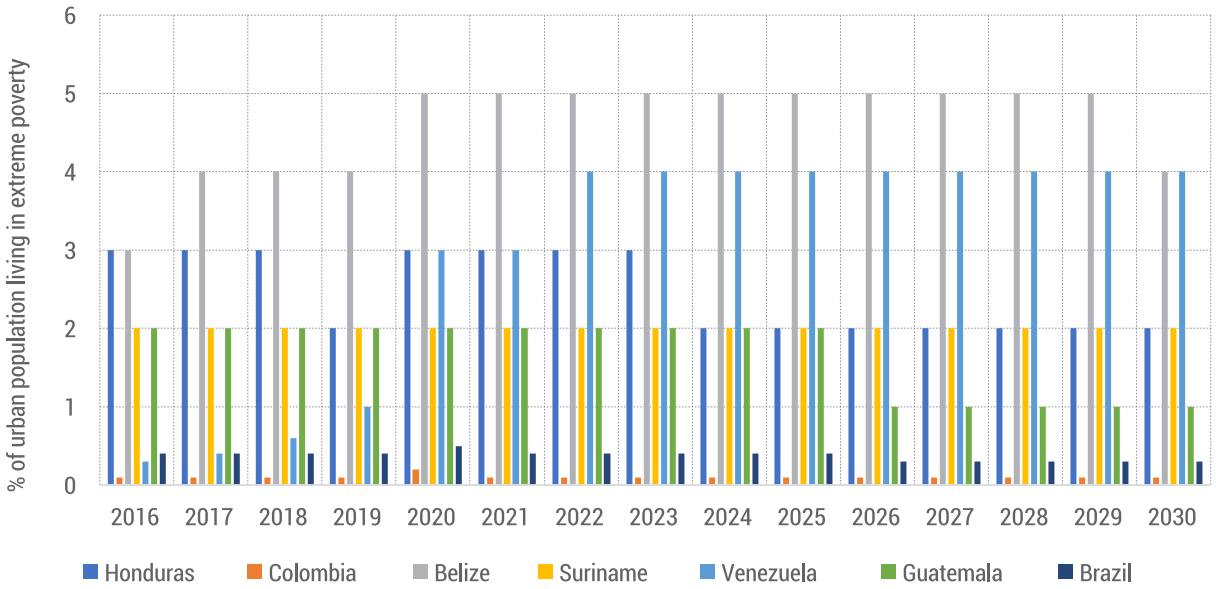
In Latin America and the Caribbean, the proportion of urban population living in extreme poverty is relatively low; with projections under 5 per cent from 2016 to 2030 (Figure 3.7). While Latin America countries have become

Figure 3.6: Proportion of urban population living in extreme poverty in selected Asian countries (2016–2030)



Source: World Data Lab, 2022.

Figure 3.7: Percentage of urban population living in extreme poverty in selected Latin American and Caribbean countries (2016–2030)



Source: World Data Lab, 2022.

more egalitarian over the last two decades, the last seven years have witnessed a gradual increase in poverty and the slowing down in the reduction of inequality. The COVID-19 pandemic has amplified urban poverty in most Latin American cities. In Bogotá, Colombia, urban poverty rates increased to 26 per cent in 2020 up from 15 per cent in 2019.[43] The exacerbation of urban poverty could cast a dark shadow on the achievement of SDG targets on poverty in the absence of decisive policy interventions. The reduction in the Gini coefficient dropped from an average of 1.1 per cent per year from 2002–2014 to 0.5 per cent per year from 2014–2019.[44] This slowdown occurred within the context of economic stagnation, huge public debt, public discontent and demands for social justice, all of which were further exacerbated by the impacts of the COVID-19 pandemic.

Despite the made significant strides made over the past decades, cities in Latin America and the Caribbean are still struggling to meet the infrastructure needs of their ever-growing population. Sluggish growth over the past few years has negatively affected investment in housing, water, sanitation and other urban services. Consequently, there are major gaps in infrastructure spending. The region will need to increase infrastructure spending from 3 to 5 per cent of GDP—about US$180 billion a year—to bridge the gap. Latin American countries spend a smaller share of GDP on infrastructure than other regions, except for Sub-Saharan Africa.[45]

cities in Latin America and the Caribbean are still struggling to meet the infrastructure needs of their ever-growing population

3.4.1. Slums and informal settlements: face of poverty in the future of cities

As the housing affordability crisis grows, the urban poor resort to living in slums and informal settlements. Over 1 billion people globally reside in slums and informal settlements and are subjected to the worst forms of deprivation and marginalization.[46] Slums and informal settlements are prevalent in Eastern, South-Eastern, Central and Southern Asia and in Sub-Saharan Africa. In Sub–Saharan Africa, 56 per cent of the region's urban population live in informal settlements, which is far greater than the average of other developing regions.[47]

The main drivers of slum growth in developing countries include rapid urbanization, ineffective planning, lack of affordable housing options for low-income households and poverty. Estimates demonstrate that a 1 per cent increase in urban population growth will increase the incidence of slums in Africa and Asia by 2.3 per cent and 5.3 per cent, respectively.[48] These dynamics demonstrate that urbanization

Poor family in, Dhaka, Bangladesh © Shutterstock

in African and Asian cities continues to occur in contexts characterized by unplanned urbanization, appalling urban poverty, weak governance structures and incoherent urban planning and housing policies. If current trends persist, the future of cities in developing regions will be accompanied by "mega slums" that will be vastly undeserved and whose residents will endure multiple deprivations, which will negatively impact on socioeconomic mobility.

Furthermore, slums and informal settlements perennially suffer from chronic underinvestment in infrastructure and basic services, which entrenches poverty and limits opportunities. For the millions of people living in slums and informal settlements, access to infrastructure and basic urban services remains elusive, without which a better urban future will be difficult to achieve. Inadequate access to water and sanitation is one of the key drivers of multidimensional poverty in slums, which has a greater impact particularly for women and children.[49] Slum dwellers also endure poor quality and overcrowded housing often built in environmentally hazardous locations, insecure tenure and risk of evictions, poor health, unemployment, food insecurity, unemployment, and stigmatization.[50] All these factors make slum dwellers highly vulnerable to external shocks and stresses like the current COVID-19 pandemic.

slums and informal settlements perennially suffer from chronic underinvestment in infrastructure and basic services, which entrenches poverty and limits opportunities

In developing country cities, refugees and migrants in informal settlements experience severe social, economic and environmental challenges, all of which worsened during the COVID-19 crisis.[51] While COVID-19 has made the challenges in slums more visible, they are a result of perpetual exclusion from urban services, reflected in acute health inequalities that were prevalent before the pandemic. For equitable urban futures, cities should prioritize extending basic infrastructure and services to slums and informal settlements. Inaction will be detrimental to the future of cities: slums and informal settlements will continue to turn into dense pockets of poverty and loci of cumulative vulnerabilities that will haunt the urban poor for decades. This will create a downward spiral of so-called "slumification,"[52] making it even more difficult for marginalized groups to escape poverty and thereby further entrenching the pessimistic scenario of urban futures described in Chapter 1.

Tenure insecurity in slums and informal settlements exposes households to forced evictions and displacements. The pandemic has amplified the urgency of strengthening tenure security in slums and informal settlements as one of the catalysts for equitable urban futures. Forced evictions and displacements disrupt livelihoods and social networks, which is linked to increased poverty and inequality. As we move into the future, strengthening tenure security in slums and informal settlements provides the rights that enable access to urban infrastructure and services.[53] Access to secure land enables slum dwellers to undertake home improvements and invest in their communities, which is often a path out of poverty for poor households.[54] These measures are a response to the

clarion call of the New Urban Agenda to promote equally the shared opportunities and benefits that urbanization can offer and that enable all inhabitants, whether living in formal or informal settlements, to live decent and dignified lives and achieve their full human potential. Without concerted efforts at all levels, residents of slums and informal settlements will always be left behind and endure the dire consequences of future shocks, especially on their livelihoods.

3.4.2. The tenuous nature of self-provisioning and the burden of poverty penalty

Without access to urban services, the poor resort to self-provision using alternative arrangements, which can be exploitative and thereby aggravate their already precarious condition.[55] Self-provision imposes crippling burdens for poor households residing in slums and informal settlements. Those that struggle to pay often spend the most for the same basic services. For example, residents of Mukuru, an informal settlement in Nairobi, bear the brunt of the "poverty penalty." They pay more than four times more for drinking water compared to those that live in formal neighbourhoods of the same city.[56] The urban poor in Nairobi's slums pay a much higher price for rental housing, water, electricity and other basic goods and services compared to middle- and higher-income residents in the city. Consequently, they have little income left for other necessities. This scenario traps families in a cycle of poverty and leads to intergenerational transmission of poverty, a trend that is increasingly evident in slums of various developing country cities.[57]

Without access to urban services, the poor resort to self-provision using alternative arrangements, which can be exploitative

The double jeopardy of inadequate services coupled with high fees must be tackled decisively to break the systemic barriers that continue to lock the urban poor in situations of endemic precarity and downward social mobility. The negative effects of self-provisioning can undermine economic prosperity of the entire city. To make matters worse, cities in developing regions are bedevilled by scarce financial resources and limited planning capacity. At the same time, these struggling cities are under tremendous pressure to meet the urgent needs of their ever-growing populations while avoiding decisions that lead to unstainable urbanization.

3.4.3. Precarious urban livelihoods and the future of cities

Globally, the urban poor earn their livelihoods from the informal sector. Informal sector workers constitute 61 per cent of all workers, which translates to 2 billion workers worldwide.[58] In developing countries, slum dwellers, migrants, refugees and other vulnerable groups work in the informal economy, earning highly irregular incomes that are vulnerable to shocks. The COVID-19 pandemic disrupted livelihoods of an estimated 1.6 billion people, or 80 per cent of those in the informal sector.[59] The resultant losses in working hours in 2020 worldwide were about four times higher than the 2007–2008 global financial crisis with higher losses for women, youth and low-skilled workers.[60] Without access to any form of social protection, the pandemic has aggravated the economic vulnerability of informal sector workers. For example, in the favelas of Rio de Janeiro where residents typically make less than US$5 a day, over 70 per cent of households reported an income decline.[61] In Khulna, Bangladesh, 70 per cent of slum dwellers had no savings when the pandemic started, which aggravated their economic insecurity once their livelihoods were disrupted.[62]

The COVID-19 pandemic also amplified the vulnerability of informal transport sector workers, particularly minibus operators in paratransit systems. A majority of the minibus operators and motor-taxi companies in Douala, Cameroon, and Dakar, Senegal, discontinued service, resulting in large income losses.[63] Chapter 4 clearly notes that in the absence of social protection programmes, informal sector workers will struggle to rebuild their livelihoods, which is detrimental to the collective vision of equitable urban futures.

As we move into the future, recognizing and addressing the lack of social safety nets or social assistance for the informal workforce is essential for tackling the current pandemic and for cities to be more economically resilient to future crises.[64] Transforming cities globally for future resilience, inclusion and economic sustainability is more urgent than at any time in human history. The path to equitable urban futures is impossible without building the resilience of informal sector workers to economic shocks. If governments fail to act decisively, informal workers will be trapped in precarious conditions with limited prospects for economic mobility.

3.4.4. Climate-related vulnerabilities and impacts on the urban poor

Despite negative effects of climate change on urban infrastructure and livelihoods in rapidly growing cities as shown in Chapter 5, some urban leaders continue to turn

a blind eye to these realities.[65] Current projections indicate that a 2°C increase in global temperature in 2050 will expose 2.7 billion people, or 29 per cent of the global population, to moderate or high climate-related risks, with 91 to 98 per cent of the exposed and vulnerable population living in Asia and Africa respectively.[66] Sea-level rises, and storm surges often adversely affect the poor and those living in vulnerable communities. For example, in Ho Chi Minh City, Viet Nam, 85 per cent of the urban poor areas may be exposed to flood risk by 2050.[67] These risks are present in most low-lying coastal cities in developing countries.

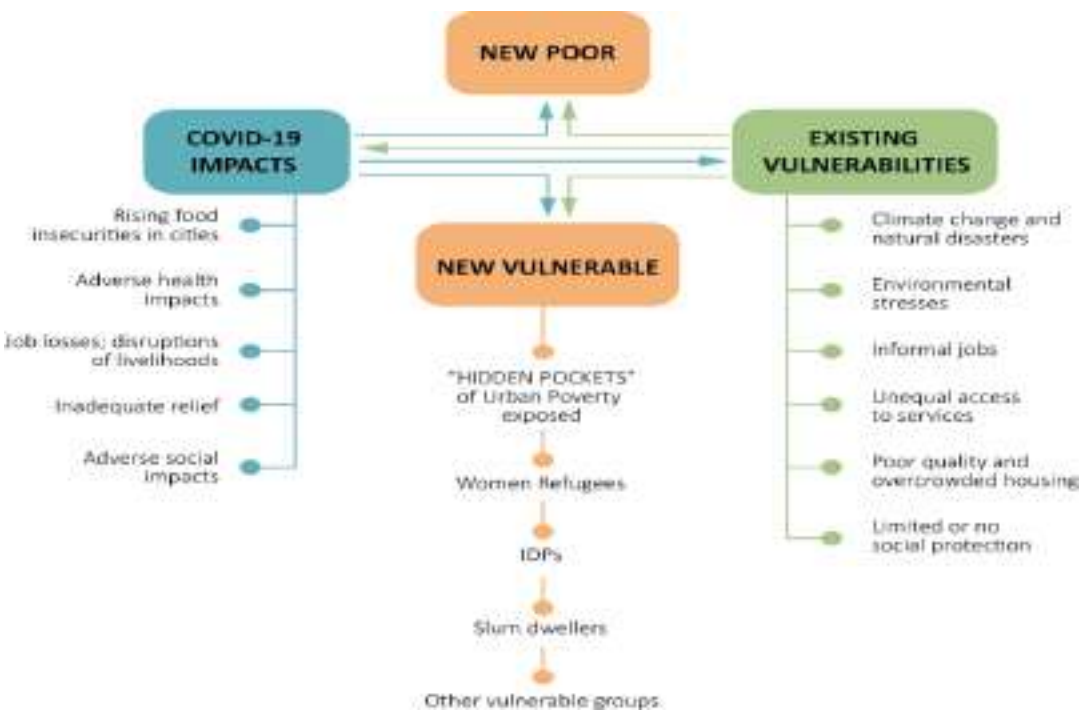
The most vulnerable populations are migrants, refugees, women, the elderly and others who live in overcrowded and risk-prone informal settlements. These populations disproportionately bear the burden of environmental risks because of their physical, social and economic vulnerability.[68] Not only does climate change make it difficult for people to escape poverty, but it also creates create a vicious cycle of deprivation that could be difficult to reverse; thereby trapping the poor in the high damage or disastrous scenario of urban futures. When hit by climate related shocks, the urban poor suffer relatively greater losses in terms of their lives and livelihoods. Such differential impacts further amplify existing inequalities and undermine the capacities of people to withstand, cope, adapt and recover from future shocks.[69] If cities and subnational governments fail to prioritize climate resilience for all, then the urban poor, especially those living in slums, will continue to bear the brunt of climate-related vulnerabilities that will undermine their well-being.

3.4.5. COVID-19 amplified urban vulnerabilities and the future of cities

The COVID-19 pandemic has exacerbated multiple deprivations and exposed structural fragilities that characterize cities in developing regions (Figure 3.8). The pandemic further exposed the stark urban services divide, particularly in cities of developing countries where there are limited egalitarian policies on service delivery.[70] The pandemic has inflicted unprecedented suffering on already marginalized urban populations—women, children, people living with disabilities, indigenous people and the homeless, among others.[71] These groups usually have limited access to basic services and precarious sources of livelihood, which make them highly susceptible to shocks. The pandemic also exposed hidden pockets of urban poverty and created a class of newly poor urban dwellers, as noted earlier.

The COVID-19 pandemic is also reinforcing pre-existing gender inequalities due to differentiated access to public services, vulnerability of informal sector jobs and the

Figure 3.8. COVID-19 exacerbates pre-existing urban vulnerabilities



additional responsibility of household and childcare imposed on women. Without significant policy and programmatic support, these vulnerable groups will struggle to bounce back and will be trapped in endemic precarity with limited prospects of upward social mobility. Cities have found themselves in an unprepared and difficult situation; they face unprecedented social, economic and health problems that must be urgently tackled if the vision of inclusive and equitable urban futures is to become a reality.

3.5. Urban Poverty in Developed Regions: Implications for Urban Futures

While cities in developing countries experience the most widespread effects of urban poverty, cities in developed countries are not immune. For example, London has seen a sharp rise in homelessness because of increasingly unaffordable housing prices.[72] In the US, deprived neighbourhoods in older cities are characterized by economic marginalization, social problems and underinvestment in key municipal infrastructure and services. In New York City, the urban poor, especially minorities, live in congested neighbourhoods and overcrowded housing stock, often in multi-generational families.[73] There are also worrying trends of urban services deprivation in Philadelphia, Baltimore and Detroit, where the urban poor have faced mass water shutoffs in recent years. The most affected are thousands of high-risk and at-risk households clustered in pockets of "water poverty," disabled individuals, blacks and Hispanics.[74] If water rates increase at projected amounts, more than 35 per cent of US households will struggle to pay their water bills.[75] The exorbitant water bills not only expose the poor to shutoffs but affects their ability to meet other basic needs.

The pandemic has derailed the European Union's target of lifting at least 20 million people out of poverty by 2020

The pandemic has derailed the European Union's target of lifting at least 20 million people out of poverty by 2020.[76] The manifestation of urban poverty in the US has a strong class and racial character. It is predominantly black and other minority dominated neighbourhoods that endure deprivations together with high rates of crime, drug addiction and continued deterioration of physical infrastructure. In contrast, the privileged elites reside in relatively wealthy neighbourhoods or suburban municipalities, where opportunities, good quality services and infrastructure are guaranteed. If governments fail to promote equitable access to urban infrastructure and services, urban poverty will become entrenched while disproportionately affecting specific groups of urban populations.

In Europe, countries such as Austria, Belgium, Demark, Germany and the Netherlands, have witnessed higher poverty rates in cities than in rural areas over the years.[77] Data from the European Union Statistics on Income and Living Conditions reveal that 22.5 per cent of the population in the region were at risk of poverty and deprivation in 2017.[78] In Sydney, there are pockets of disadvantage concentrated in the western and southwestern suburbs where the manifestation of urban poverty has gender and racial dimensions.[79] Currently, the proportion of Aboriginal people on a low income in Sydney is 21.1 per cent, compared to 10.2 per cent of non-Aboriginal people.

Despite high economic growth in cities of developed countries, minority groups, migrants, refugees, the homeless and indigenous peoples, among others, experience structural barriers that perpetuate their marginalization. Failure to address these challenges will create conditions for cumulative deprivations that will lead to a vicious cycle of urban poverty for decades. In worst case scenarios, intergenerational poverty could worsen, as families struggle to break barriers that undermine their economic mobility. Failure to prioritize the needs of minorities and other vulnerable populations in developed country cities could forestall the drive towards inclusive and equitable urban futures.

3.6. Urban Inequalities in Developing Regions: Matters Arising for Urban Futures

The opportunities associated with urbanization in cities of developing regions are not equally shared. Increasing levels of inequality are becoming pervasive in these cities, which is where most of the population growth will occur over the next 30 years.[80] Despite a steady decrease in extreme poverty, inequality within cities has generally been growing. Cities of developing regions experience the highest levels of inequality, especially in Latin America and Sub-Saharan Africa.[81]

In addition to high levels of income inequality, millions of people in Latin American cities face spatial disparities and social segregation, which manifests through fragmentation

of social services: the wealthy, the middle class and the poor do not share the same facilities and amenities.[82] If not addressed, these alarming levels of inequality will create vicious circles that will be harder to reverse. Income and opportunities will be concentrated in the hands of the few urban elites, while the poorest bear the brunt of unequal income distribution.

Sub-Saharan Africa is second after Latin America with respect to income inequality in cities. Close to three-quarters of the cities in Sub-Saharan Africa have high levels of inequality as indicated by Gini coefficients exceeding 0.4, with South African cities being the most unequal in the region.[83] The astronomical levels of income inequality in Latin America and Sub-Saharan Africa reflect institutional and structural failures in the drive towards more equitable and just cities.

Cities in Asia have the lowest levels of income inequality among developing regions

Cities in Asia have the lowest levels of income inequality among developing regions. There are significant regional variations in urban inequalities, with the largest disparities between basic and safely managed water services for urban populations in Central and Southern Asia.[84] Despite being the 12th richest city in the world, Mumbai is marked by extreme disparities where the city's wealth is concentrated in the hands of the few. People in the poorest districts of Mumbai earn only 25 per cent of what people in the wealthiest districts earn.[85] Chinese cities are characterized by increasing residential segregation because of the hukou household registration system. High income groups in Beijing and Shanghai reside in privatized neighbourhoods, while rural migrants congregate in urban villages and worker enclaves, sometimes with limited access to opportunities and social amenities. Failure to address these dimensions of inequalities could aggravate the exclusion and marginalization of the poor, with dire consequences for equitable urban futures.

3.6.1. The urban service divide and its implications for urban futures

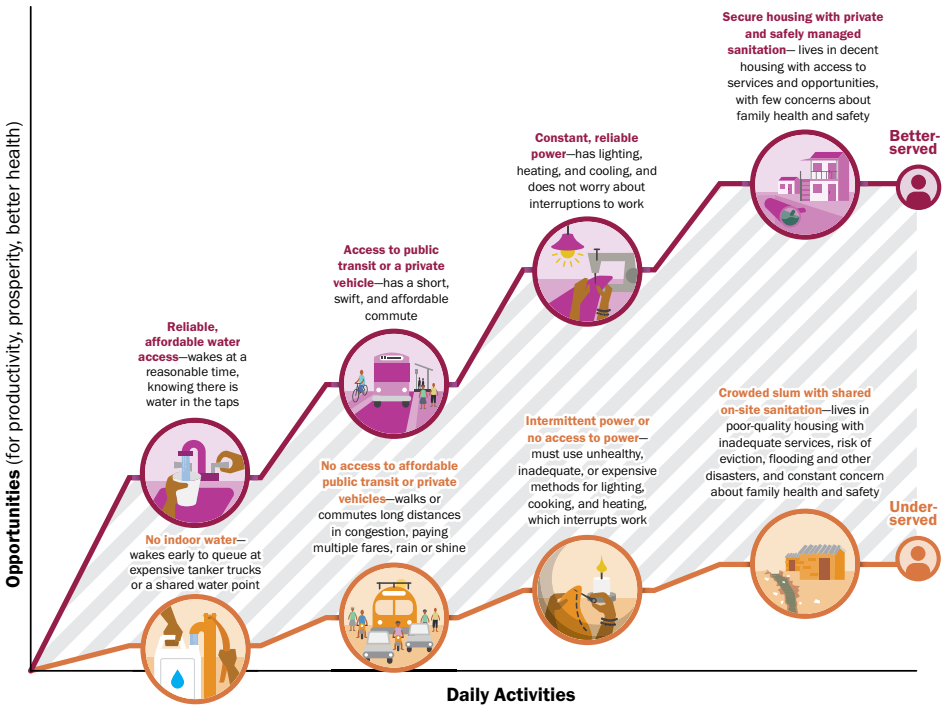
The urban services divide in cities of developing countries is a manifestation of urban inequalities.[86] Unequal access to high-quality, reliable and affordable essential infrastructure and services often results in poor health, inflicts environmental damage and locks people in cycles of poverty for generations. In absolute numbers, 63 million people in urban areas in Sub-Saharan Africa have no access to safe water sources.[87] Currently, only 44 per cent of all Sub-Saharan Africa's urban residents have access to basic sanitation services.[88] In Sub-Saharan Africa, rich households in urban area are 329 per cent more likely to have access to improved water sources and 227 per cent more likely to have access to improved sanitation facilities compared to poor households.[89] This urban services divide is more pronounced in secondary cities, and this is expected to widen as these cities are often neglected in public infrastructure investment.[90]

Those living in slums and informal settlements are disproportionately affected by this urban services divide; they bear the brunt of disease outbreaks, economic shocks and environmental risks. Studies have demonstrated that disparities in accessing essential infrastructure and urban services can have greater impact on lives, livelihoods and long-term prospects compared with differences in earnings.[91] In developing country cities, relatively well-off communities are better served with core infrastructure and services compared to poor communities, thus creating a huge urban services divide (Figures 3.9 and 3.10).[92]

Figure 3.9 demonstrates a sharp contrast between better-served and underserved urban groups. While the urban services divide creates more opportunities for better served groups, it places higher burdens for poor communities in terms of cost, time and ill health, limiting their opportunities for prosperity. If the current urban services divide is not addressed, the long-term impacts on the future of cities will be dire, as it creates a vicious cycle of deprivation that will be hard to escape for millions of the urban poor.

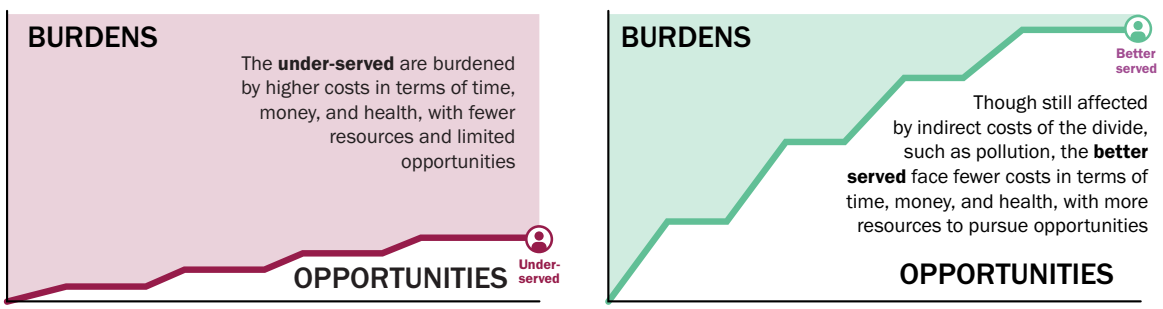
As indicated in Figure 3.10, the cumulative costs of this stark urban services divide are huge: worsening inequalities, lagging productivity and further environmental damage. More than 1.2 billion urban residents are underserved worldwide, which represents two out of every three city dwellers in low-income countries.[93] This divide poses a major challenge to attaining inclusive, sustainable and equitable urban futures in developing regions. Unequal access to infrastructure and services perpetuates a vicious cycle that becomes increasingly difficult to escape. The urban services divide encumbers cities in ways that weaken their economic vitality.[94] Without drastic and purposeful change, the rapidly expanding cities of developing regions will find it hard to escape this trajectory. Therefore, equitable access to urban services is a key lever for achieving inclusive and equitable urban futures and delivering on the optimistic scenario described in Chapter 1.

Figure 3.9: The differential consequences of the urban services divide on the poor

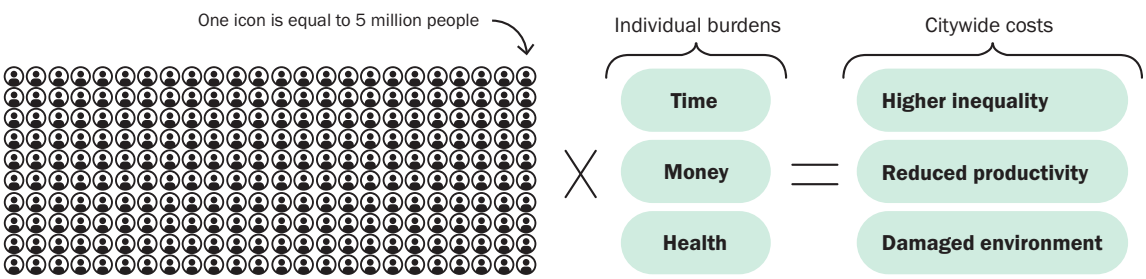


Source: Adapted from Mahendra et al, 2021, p. 14.

Figure 3.10: Urban services divide leads to higher burden for the underserved



The cumulative costs of the urban services divide impact everyone in the city



Source: Adapted from Mahendra et al, 2021, p. 15.

3.7. Urban Inequalities in Developed Regions and the Future of Cities

Generally, urban inequalities are relatively lower in developed regions because of the prioritization of egalitarian policies. Nonetheless, income inequality, socioeconomic disparity and spatial exclusion are becoming rife in cities in developed countries. Cities in developed regions generate over 60 per cent of jobs and economic growth, but not all cities have managed to grow inclusively.[95] The most unequal cities in the US have become more unequal, as eight of the ten most unequal cities experienced an increase in their Gini coefficients between 2010 and 2018.[96] This trend has been further exacerbated by the COVID-19 (Box 3.1).

income inequality, socioeconomic disparity and spatial exclusion are becoming rife in cities in developed countries

The Gini coefficient does not capture the multiple dimensions of urban inequalities. However, in some situations the Gini index correlates with socioeconomic data. For instance, due to high income inequality, Miami was ranked 265th out of 274 cities by the Urban Institute's overall inclusion rankings—along with high levels of racial segregation.[97] This demonstrates that income inequality measured through the Gini coefficient can interact with other socioeconomic dimensions of inequality to produce highly unequal and divided cities, where wealth and urban opportunities become concentrated in the hands of a few.

Failure to address the above challenges could be detrimental to the goals of inclusive and equitable urban futures. Cities in the US could see a massive increase in the number of highly segregated neighbourhoods where minorities face chronic underinvestment in basic infrastructure and services, deteriorating job opportunities, increased crime rates, poor health delivery systems and downward economic mobility.

In European cities, there is mounting evidence of growing inequalities. In 2017, 112 million EU inhabitants or 22 per cent of the total population were at risk of poverty or social exclusion.[98] While EU cities are characterized by high standards of living, they are also places of moderate to high levels of income inequality. In recent years, wealth has increasingly become concentrated in the hands of the few, and this polarization of wealth is most concentrated in urban areas (Figure 3.11).[99]

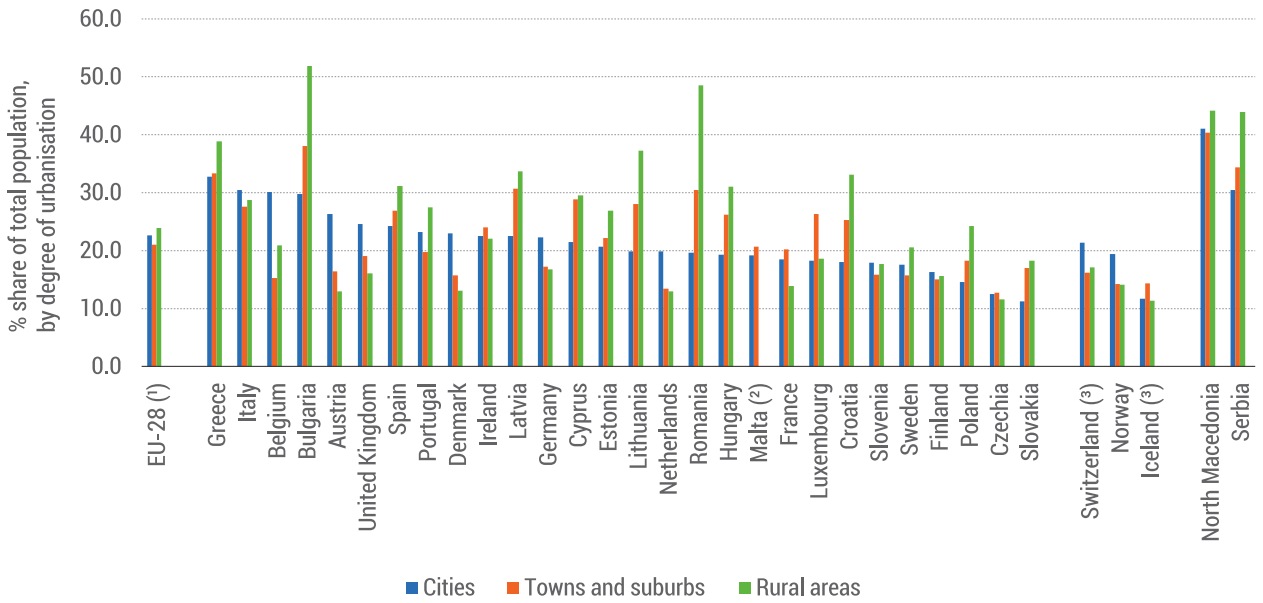
In most European cities, welfare programmes, housing markets, place-based policies and migration dynamics play a major role in shaping socioeconomic segregation at the neighbourhood level. For instance, the high levels of socioeconomic segregation in Brussels are the outcome of a small share of social housing, limited placed-based interventions and territorial processes that have created a divided city.[100] Naples, Italy, is a city deeply marked by socioeconomic inequalities have been driven by urban segregation and the lack of financial instruments to bridge the gap.[101] The spatial concentration of deprivation in European cities is closely linked to other dimensions of inequality such as inadequate education, poor health and limited employment opportunities.

Box 3.1: The "troubled spots" of residential segregation in United States cities

In US cities, consumer-oriented modes of production have created separate and unequal landscapes or urban neighbourhoods, with negative impacts on health, social mobility and economic prosperity for racialized communities. The current COVID-19 pandemic has laid bare these structural inequities and their differential impact on the people of colour. Nationally, black people are dying from COVID-19 at 2.4 times the rate of white people because of the inequitable living conditions, underlying structural conditions and unequal access to health services that characterize segregated neighbourhoods. Residential segregation has made it possible for government authorities to implement discursive measures such as withholding resources from minority communities through a host of negative policies and practices, including over-policing and underinvestment in urban infrastructure. These are forces that impede wealth accumulation and halt social mobility. As of 2016, the median net worth among white families was 10 times that of black families, and more than eight times that of Latino or Hispanic families.

Source: Loh et al, 2020.

Figure 3.11: People at risk of poverty or social exclusion in European cities (2017)



Source: Joint Research Centre, 2019.

3.8. Responding to Poverty and Inequality in Cities

Tackling poverty and inequality remains one of the key global priorities for creating equitable and inclusive cities that provide opportunities and prosperity for all. Without inclusive cities, the impacts of future shocks and stresses may be even more acute than the current COVID-19 pandemic.[102] Achieving this vision of a more egalitarian society that leaves no one behind is not guaranteed; it requires bold actions to break the structural barriers that trap people in cycles of poverty and inequality. Currently, cities are experiencing multiple crises (health, financial, political, economic and environmental), all of which complicate responses to poverty and inequality. The levels of urban poverty and inequality, coupled with the devastating impacts of the COVID-19 pandemic, send a clear message that governments must act now to create conditions that nurture inclusive and equitable urban futures. Without decisive action at all levels, the current situation will only worsen.

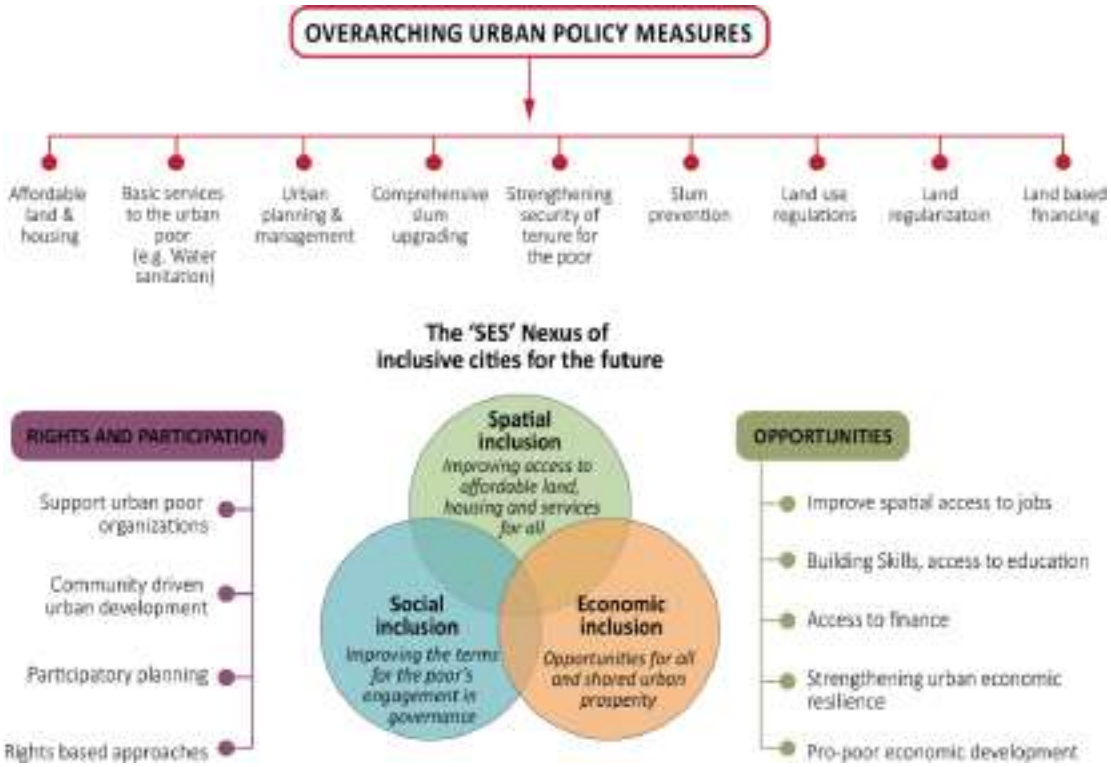
Tackling poverty and inequality remains one of the key global priorities for creating equitable and inclusive cities that provide opportunities and prosperity for all

3.8.1. A multidimensional approach to an inclusive and equitable urban future

The urgency of new approaches for transformative change in cities cannot be overemphasized; the time for short-lived, piecemeal solutions should be a thing of the past. Urban poverty and inequality are increasingly becoming persistent and complex challenges, which call for new approaches. Narrow, sectoral approaches are not effective amid the social, economic, political and environmental crises that trap most residents in poverty. Within the Decade of Action window, it is pertinent for cities and subnational governments to adopt a multidimensional approach to addressing poverty and inequality. Such approaches must extend beyond conventional hard infrastructure programmes and look at the multiple spatial, social and economic factors that lead to exclusion and marginalization.

The spatial, social and economic dimensions of cities are crucial to building sustainable and equitable urban futures (Figure 3.12). These dimensions are interrelated. For instance, affordable public transportation provides access to jobs; jobs increase access to housing and basic services; and access to housing and services increases participation in urban governance and decision-making processes. Given the multiple deprivations facing the poor in cities, a multidimensional response could generate significant gains in marginalized urban communities. The integration of spatial,

Figure 3.12: Multidimensional approach to equitable urban futures



Source: Adapted from World Bank, 2015, p. 13

social and economic dimensions of urban development can break structural barriers that create vicious cycles of poverty.

3.8.2. Extending infrastructure and services to under serviced communities

Another priority action for tackling urban poverty and inequality is extending infrastructure and basic services to the most deprived neighbourhoods. The current COVID-19 pandemic is a vivid reminder that access to basic water and sanitation facilities can be a matter of life and death. Cities are uniquely positioned to develop urban infrastructure to improve the quality of life for the most vulnerable urban populations while at the same time responding to threats that exacerbate inequalities, such as climate change. Targeting improvements in quality, coverage, and affordability to disadvantaged neighbourhoods often results in citywide transformations. The cities of Colombo, Sri Lanka; Kampala, Uganda; and Nairobi have shown that extending piped water and sewer networks in low-income neighbourhoods improves public health, protects the environment and allows citizens to be more productive.[103]

Extending infrastructure and basic services to deprived neighbourhoods can galvanize action towards building inclusive, thriving and resilient cities. Making these transformations does not only enhance equitable access to urban services but can also yield large dividends and cascading benefits for the entire urban economy.[104] It is estimated that every dollar invested in developing water and sanitation infrastructure generates between US$4–34 in benefits by improving health outcomes and boosting urban productivity.[105] The revitalization of water and sanitation infrastructure in targeted neighbourhoods in Afghanistan led to a 6.4 per cent annual increase in private investments in land, housing and real estate.[106] Moreover, extending basic infrastructure and services to slums is critical to building livelihoods, improving quality of life and strengthening public health (Chapter 7), as well as and stimulating the local economy.

The cumulative effects of equitable access to urban services to poverty reduction can be significant. Equitable access to urban services is a necessary, but not sufficient

condition. Cities must be transformed at a deeper level in their governance and decision-making structures, planning approaches, institutions and priorities of political leaders. These ingredients are vital for addressing poverty and promoting urban prosperity for all.

3.8.3. Recognizing and supporting the urban informal employment

The COVID-19 pandemic is an opportunity to better recognize informal sector workers for their legitimate contribution to urban economies. The informal economy must be supported not only because it provides livelihoods for the working poor, but also because it supplies goods and services that keep the city's formal economy running (Chapters 4, 6 and 10). The implementation of pro-informal sector urban policies can unlock the hidden value that this segment of the economy carries as well as transform the livelihoods of millions of people that are employed in this sector.[107] This issue is addressed in the SDGs, particularly through SDG 8: "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all." Prioritizing the informal sector in urban programmes will help achieve the SDGs on poverty, gender equality and equality.

Looking into the future, cities must stop the exclusion and harassment of informal workers. The harassment and penalization of street traders, waste pickers and market vendors must be halted, and their rights respected (Figure 3.14).[108] These rights include legal recognition, social and economic rights, access to essential infrastructure and services and better representation in urban governance and policymaking processes. In the Indian cities of Surat and Ahmedabad, the Mahila Housing Trust negotiated with city authorities and leveraged city funds on behalf of informal sector workers.[109] These funds were used to upgrade housing conditions and access solar energy technologies to run refrigerators, soldering irons and sewing machines for home-based workers.

Looking into the future, cities must stop the exclusion and harassment of informal workers

For these priority actions to materialize, there are key roles which key urban stakeholders can play in supporting informal employment (Table 1.1). For inclusive urban futures, it is important for cities and subnational governments to acknowledge that informality is the dominant mode of contemporary urbanization in developing countries; therefore, urban policies and programmes should be developed from this perspective. Thus, cities must rethink and review the current exclusionary urban planning approaches in ways that are responsive to the needs of informal activities (Chapter 6). Cities cannot eradicate poverty or become more equal and economically productive if they continue to exclude or harass large populations of the informal workforce. Urban planning and policymaking that considers informal workers is difficult but not impossible. It requires a shift in the mindset of policymakers and city planners to recognize the contribution of informal economies to the livelihoods of the urban poor.

Crowds outside railway terminus during a nationwide lockdown in Mumbai/India © Shutterstock

Table 3.1: Roles of specific actors in supporting informal sector workers

Key Actors	Specific roles in supporting informal sector workers
City governments	▪ Recognize the challenges of different types of urban informal workers and their contribution to urban economies in different sectors ▪ Improve access to essential urban infrastructure and services ▪ Enhance access to public spaces, procurement opportunities and social protection programmes
Civil society, social movements, and non-governmental organizations	▪ Defend social and economic rights of informal workers ▪ Collaborate with urban governments to increase the access of informal workers to public spaces, public services and public procurement opportunities ▪ Advocate for a more inclusive vision of economic prosperity, so that it is shared across all who contribute to the workforce ▪ Ensure equal employment rights and security for informal workers, including social and fiscal safety nets in times of crisis and disasters ▪ Support and facilitate participation of informal workers groups in urban decision-making that affects their lives and livelihoods
National governments	▪ Create incentives for cities to offer public procurement contracts for services such as waste management to informal worker organizations with a path to formalization and benefits ▪ Engage informal worker organizations when setting policies in sectors in which they are employed, and support them in negotiations with local governments
Private sector	▪ Partner with informal small entrepreneurs to invest in local innovations ▪ Comply with wage laws and offer paths to formal employment and reliable livelihoods with benefits and insurance schemes ▪ Include informal workers in supply chains for goods and services and provide reliable business to support their livelihoods ▪ Create and operationalize innovative credit instruments in the banking sector for informal workers and businesses investing in informal settlements, thus fostering financial inclusion
International community, including development finance institutions	▪ Develop financing programmes that help cities integrate informal workers into formal employment and service delivery systems, with social and fiscal safety nets, health benefits and secure livelihoods ▪ Incentivize a change in mindset to acknowledge the implications and contributions of the informal economy ▪ Design programmes that ensure economic gains are distributed for shared prosperity, ensuring access for all citizens to the full range of opportunities the city offers

Source: Adapted from Mahendra et al, 2021, p. 129.

3.8.4. Inclusive and gender transformative approaches for equitable urban futures

It is paramount for cities to develop inclusive urban governance systems and processes that promote transformative resilience to multiple crises by using local knowledge in the face of uncertainty. The quality of local governance and use of local knowledge strongly influence access to shelter, services, infrastructure and emergency response.[110] These approaches have been instrumental as part of the COVID-19 response strategies.

Urban leaders must draw on grassroots, civil society and private sector efforts to build local alliances to deliver more effective strategies of addressing poverty and inequality. If cities harness local knowledge, they can effectively understand how complex risks are experienced. This perspective becomes the basis for developing forward-looking strategies that build the resilience of the poor in the face of multiple risks.[111] Cities should therefore support inclusive, gender-transformative responses that are co-produced with marginalized urban populations, including attention to intersecting inequalities as noted in Chapter 1. These strategies will require working closely with specific urban groups such as:

- Women and girls who bear the brunt of care burdens and underrepresentation in urban governance structures
- Ethnic minority groups who are often disproportionately burdened by shocks and bear the brunt of discrimination and systemic exclusion from urban development processes

- Migrants, refugees and internally displaced persons who face heightened risk of socioeconomic exclusion and marginalization

- People with disabilities and the elderly who may have pre-existing health conditions and may struggle with accessing infrastructure and urban services

3.8.5. Place-based interventions to build resilience in "urban weak spots"

Cities should prioritize efforts to build resilience in their "urban weak spots" so that they can withstand future shocks and stresses (Box 3.2). Urban weak spots are areas such as slums and informal settlements that are characterized by poor services, overcrowding, hazardous locations, high risk of eviction and multiple vulnerabilities. By amplifying these vulnerabilities and creating new ones, the COVID-19 pandemic send a strong message on the need to address the structural inequalities in cities. Failure to do this will trap millions of people in zones of deprivations with limited prospects of upward mobility. Cities and subnational governments should therefore develop and implement citywide upgrading and renewal strategies based on need and disadvantage that prioritize investment in urban weak spots.

City leaders should think creatively about improving housing options for the poor. Existing evidence shows that in situ upgrading is preferable to relocation, except in cases when people need to move for their safety or to serve an overwhelming public need.[112] Implementing upgrading strategies in partnership with local communities helps cities harness untapped skills and the lived experiences of these communities. This collaborative approach will improve access to basic infrastructure and services, economic productivity, and overall quality of life for the marginalized.

There are emerging models of best practices in participatory slum upgrading, which provide important lessons on how slums and informal settlements can act as entry points for place-based interventions. In Nairobi and Windhoek, Namibia, there have been strong alliances between local governments and community groups in slum upgrading interventions. These cities are changing urban planning and land-use regulations to improve infrastructure quality and access as well to enable incremental building over time.[113] In Thailand, cities have partnered with community-based organizations and NGOs to upgrade informal settlements through the Baan Mankong programme, creating a model that has been scaled up to over 215 cities in 19 Asian countries.[114] These grassroots, bottom-up housing and slum upgrading programmes tapped into local knowledge, while combining with government funds and approvals to serve as an innovative model throughout the region.

Box 3.2. Building the resilience of "urban weak spots" to future shocks

In the long term, international and regional financial institutions like the World Bank, the Africa Development Bank and the Asian Development Bank can support the scaling-up of slum-upgrading interventions to strengthen investment in infrastructure and services for underserved communities. Funding from development banks can be mobilized through grants and/or low-interest micro-loans (or a combination) for housing improvements. This approach would quickly get cash to households to make needed shelter improvements that would build resilience to future crises and serve to stimulate the formal and informal construction industries, on which many informal, urban poor workers rely. Investing in homes can serve to reduce the spatial inequalities that exist within cities between the formal and informal sector, as well as build longer-term household wealth. Improvements in housing could also reduce overcrowding and thus vulnerability to future health crises. This kind of investment is important for building longer-term resilience and reducing the social disparity that exists in cities.

Source: World Bank, 2020

The success of place-based interventions depends on the existence of political will to pursue pro-poor urban development

The success of place-based interventions depends on the existence of political will to pursue pro-poor urban development. This approach to urban policymaking empowers poor communities to demand and realize their rights and entitlements, matched by financial, human and technical capacity to create conditions for socioeconomic changes on the ground. Community-led slum upgrading interventions, like those in Bangkok, Thailand, have produced well-serviced and affordable housing for the poor.[115]

3.8.6. Bottom-up urban resilience building for sustainable urban futures

The COVID-19 pandemic and the looming climate crisis have demonstrated the urgency of building resilience in the planning, governance and management of cities. Chapter 10 notes that building resilience for sustainable urbanization requires linking in an integrated way the various pillars of the 2030 Agenda for Sustainable Development. The COVID-19 pandemic presents an opportunity for urban leaders to prioritize building long-term resilience of cities against all forms of shocks.[116] The pandemic has intensified the pattern of emergencies, with urban areas bearing the brunt. In the same vein, almost two-thirds of cities with more than 500,000 residents are at high risk of exposure to floods, droughts, earthquakes and other natural disasters.[117]

The Moving Urban Poor Communities in the Philippines Towards Resilience (MOVE UP) model provides important lessons for the future of cities with respect to pro-poor resilience interventions (Box 3.3). Specifically, the urban poor and at-risk communities must be at the centre of interventions targeting the institutional, social, economic, environmental and infrastructural dimensions of resilience.[118] The MOVE UP model demonstrates that the participation of at-risk communities strengthens their capacities and engenders a sense of ownership over projects.

Box 3.3: Moving Urban Poor Communities in the Philippines Towards Resilience (MOVE UP) Model

Urban context in the Philippines

Cities in the Philippines are characterized by rapidly expanding informal settlements, the majority of which are situated in environmentally hazardous areas. Most of the 1.5 million informal settlement residents do not have access to essential infrastructure and basic urban services such as water and sanitation. Residents of informal settlements are highly vulnerable to climate-related impacts. The COVID-19 pandemic has worsened the situation by disrupting livelihoods of thousands of poor households.

How does the MOVE UP Project help build resilient communities?

The MOVE UP Project envisions resilient communities as those that can prepare and bounce back from shocks and stresses because: they have the resilience capacities to do so; the society they live in is inclusive and equitable; and good governance provides an environment that enables them to participate in public life and decision-making. The MOVE UP project places urban poor communities at the centre. The project was designed based on the idea that communities become more resilient if they have strong resilience capacities, and if the society they live in has well-developed social, economic, environmental, institutional and infrastructure sectors. To help achieve this ideal, the project employs three main strategies—building resilience capacities, improving social positions and creating an enabling environment.

Building resilience capacities entails increasing urban poor communities' capacities to anticipate, respond to, adapt to and transform risks. Aside from bolstering these resilience capacities, livelihoods and livelihood assets may also be made more resilient by strengthening, diversifying and protecting them. This is particularly important in the context of COVID-19 where livelihoods of informal settlement dwellers have been eroded due to lockdown measures and lack of social safety nets from governments.

Improving social positions means advancing social inclusion relating to gender, ethnicity, age and disability; increasing organizational capacity; and pushing for the equitable distribution of capital and assets.

Creating an enabling environment consists of promoting participatory and inclusive governance processes that follow the rule of law.

The project was a collaborative effort between different stakeholders such as communities, civil society and non-government organizations, private sector, local government units, and the national and subnational levels of government. By focusing on improving shelter conditions during emergencies and making livelihoods more resilient to shocks and stresses, MOVE UP hopes to strengthen the resilience capacities of urban poor communities and their respective local governments.

Source: Resilience and Innovation Learning Hub, 2020.

As cities recover from the pandemic, their resources should be directed towards collaborative resilience building with poor urban communities (Chapter 8). If cities are planned and managed using such innovative and bottom-up approaches, new opportunities for tackling poverty and inequalities will be unlocked. No urban intervention will succeed without putting the poor communities at the centre. Failure to invest in urban resilience can reverse development gains by pushing millions back into poverty.[119]

3.9. Transformative Policies for Inclusive and Equitable Urban Futures

The COVID-19 pandemic provides a unique opportunity to reimagine transformative urban policies that redress poverty and inequalities in cities. The UN-Habitat report Cities and Pandemics: Towards a More Just, Green and Healthy Future advocates for a "new social contract" in the form of universal basic income, universal health coverage and universal housing and basic services (Chapter 1).[120] The COVID-19 pandemic has exposed the gaps in social protection coverage, given its disproportionate impact on the livelihoods of the urban poor and low-income workers.[121] Policy interventions by both national and local governments are important for bolstering the resilience of vulnerable groups to future shocks. There are increased calls global for universal social protection on the grounds of both efficiency and equity.

3.9.1. Social protection for the most vulnerable groups

Social protection is a potentially powerful policy tool for redistributing wealth and addressing urban poverty and inequalities, which have become defining features of cities especially in developing countries (Chapter 1). The need to reform social protection programmes has never been this urgent. Social protection programmes have the potential to contribute to the achievement of several SDGs. If social protection covers some form of basic income, housing and health, then it can contribute to achieving several SDG targets. For instance, SDG target 11.1 seeks to ensure access for all to adequate, safe and affordable housing and basic services; thus, social protection can directly enhance access to these basic needs.[122] Prioritizing the poorest urban households in social protection interventions could generate more progress in addressing poverty and inequality. Transformative social protection is hinged on the notion that poverty and vulnerability have social and economic dimensions, which call for more than income support. What potentially makes such interventions transformative are efforts to dismantle structural barriers such as discrimination against marginalized and vulnerable groups.[123]

Social protection is a potentially powerful policy tool for redistributing wealth and addressing urban poverty and inequalities

Formal social protection assistance coverage is generally higher in rural areas. The COVID-19 pandemic has amplified the urgency of urban social protection programmes. A key lesson from implementing social protection programmes in Latin America and Asia is that replicating rural models in urban settings will not work. This experience calls for adapting or redesigning social protection interventions to make them appropriate for urban-specific vulnerabilities.

3.9.2. The critical pillars of social protection in cities

There are three key pillars of urban social protection that should be prioritized (Figure 3.13). The first is social protection for informal workers.[124] Workers in the informal sector endure precarious livelihoods, unpredictable incomes, and difficult working conditions. During the COVID-19 pandemic, street traders' vending markets were destroyed in the name of public health measures, which contributed to massive loss of livelihoods and incomes, thus deepening poverty. These informal workers rarely have unemployment insurance, social assistance or any form of safety net. If cities are to serve as engines of inclusive growth, then social protection and dignified work should form related policy elements of equitable urban futures. A transformative approach to social protection would include implementing regulation and monitoring to ensure the health and safety of all urban workers. In fact, the COVID-19 pandemic has demonstrated the urgent need to strengthen the links between social protection and livelihoods.

Going forward, governments should ensure strong linkages between social protection and livelihoods to help the most vulnerable workers build more resilient livelihoods.[125] In the Indian cities of Bengaluru and Pune as well as in Brazil, Colombia and Argentina, local governments have signed contracts with previously informal waste picker cooperatives for door-to-door waste collection.[126] Cities should also recognize informal sector workers as legitimate economic actors through integration of their livelihoods activities into urban policies and plans.

Figure 3.13: Pillars of urban social protection

The second pillar of social protection is adequate urban housing for all, as millions of the urban poor, especially in developing countries, live in slums, informal settlements and various forms of inadequate housing. Measures to achieve adequate housing for all not only entail financial resources, but also involve legal claims on tenure and an assertion of the right to the city. The housing affordability crisis in cities of developed and developing countries is a grave concern. For instance, in Australia, there is a constant rejection of the view that social housing should be expanded to ensure all households are able to access decent, affordable housing.[127] This view is incompatible with the current global goals of promoting access to decent and affordable housing for all.

To address the current housing affordability crisis, governments at all levels should prioritize targeted social housing programmes. Latin American countries have been at the forefront of housing subsidies.[128] In Chile, the ABC programme (ahorro or "savings," bono or "subsidy" and credito or "loans")[129] uses the savings of residents as a financial basis on which to offer loans and subsidies to make housing more affordable.[130] In Brazil, pragmatic public-private partnerships involving the three levels of government are used to redevelop city land and create space for affordable housing in the centre of São Paulo.

Cities could promote rental housing by converting underutilized urban land to affordable housing[131] and invest in public transport to connect housing with employment centres. Subsidized housing programmes should be carefully designed as poorly structured incentives can have negative outcomes. Ambitious social housing programmes that are insensitive to location have been an important driver of urban expansion without access to basic services and have created a mismatch between where houses are built, where people want to live and where services are available.[132] National governments should create decentralized frameworks that empower cities to implement an appropriate housing policy mix best suited to the needs of their local population.

Access to essential public services constitutes a third area of convergence between social protection and urbanization. The COVID-19 pandemic demonstrated the centrality of essential services—water, sanitation, transport and energy, among others, for the well-being of urban dwellers. However, a majority of the poor including those living in informal settlements, refugee camps and migrant dormitories do not have access to these services, making them highly vulnerable. Social protection can alleviate access constraints by giving poor households subsidized or free access to these services. City governments could experiment with innovative models of social protection for urban services provision by designing well-structured, targeted subsidies for affordability and social returns.[133] Providing targeted subsides for electricity and water connections for the neediest residents has proven effective and affordable, allowing residents to pay the upfront costs over time. Several cities across Chile, Colombia and South Africa subsidize water for households below a certain income threshold, using existing socioeconomic classifications.[134] However, such programmes will need to be carefully designed to ensure that the most vulnerable derive the intended benefits.

Poorly designed interventions can have unintended consequences, with the low-income and poor households paying more for inferior services and the publicly-funded subsidies going to higher-income groups. In Asia, China has experimented with urban social protection and demonstrated that it is practical to implement such measures by adopting an integrated system that recognizes the need to go beyond

Box 3.4: China's integrated urban social programme *Dibao*

The Chinese government introduced the Regulations on Minimum Subsistence for Urban Residents, abbreviated as *Dibao*, which is a formal poverty-oriented measure to support low-income urban working households. In addition to *Dibao*, China's urban social protection regime includes education, health, employment, housing, disaster relief and temporary assistance programmes targeted at *tekun* people (those destitute, in extreme difficulty and poverty), urban residents with no labour capacity, no income, and no legal guardian. The primary target beneficiaries of these urban social protection programmes are the working poor, older persons without pensions, needy children and persons with disabilities. In terms of housing, local governments give priority to low-income families in urban areas facing housing insecurity priority in the allocation of public rental housing, rental subsides and home renovation schemes.

There are several important lessons emerging from the Dibao programme:

i. Social programmes designed for urban areas should target the most marginalized groups, especially those that struggle to access urban labour markets.

ii. The design of social protection programmes must consider the multiple dimensions of urban vulnerabilities such as lack of access to basic services like education, health and housings.

iii. Social protection programmes should form part of the multilevel governance response to urban poverty and inequalities, providing a framework through which cities can promote inclusive and equitable urban futures.

Source: Lixiong, 2018.

income support measures (Box 3.4). The country's locally designed Dibao programme integrates a fragmented system within a planned framework and establishes a security net to meet basic needs of all people towards social justice and inclusive cities.

3.10. Success Factors for Social Protection Policies in Urban Areas

The implementation of successful urban social protection policies and programmes will not happen by chance. It depends on factors such as consideration of urban-specific vulnerabilities, governance and institutional reforms, data-driven targeting, rights-based approaches, comprehensive and integrated design of interventions, and political marketing, among others.

3.10.1. Addressing urban-specific vulnerabilities

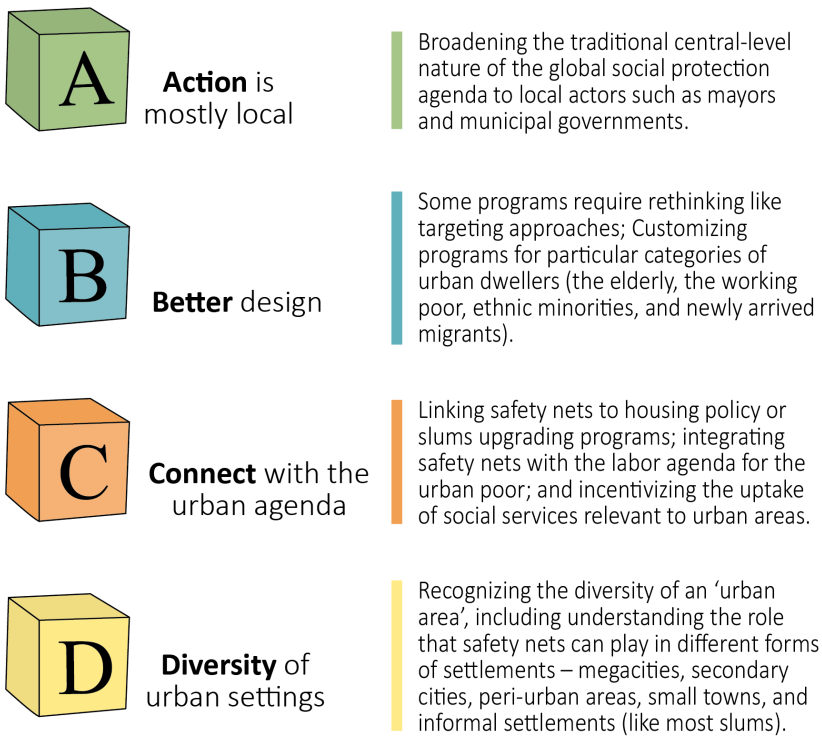
A key le sson from the implementation of social protection policies in Asia and Latin America is that simply replicating rural models in urban settings does not work because urban-specific vulnerabilities are complex and multidimensional, which necessitates adapting or re-imagining the design of these programmes.[135] Social protection interventions that fail to consider urban-specific vulnerabilities such as higher living costs, high levels of informality and unemployment, and unequal access to urban services, among others, will have limited success.

Urban vulnerabilities manifest differently in different geographical contexts; therefore, a one-size-fits-all approach will not work. Figure 3.14 shows some of the key design considerations for urban social protection given that urban poverty and inequality across cities are highly differentiated—factors which determine the design of urban social protection interventions. Cities should tailor strategies that respond to different form of vulnerabilities. Social protection interventions should be nuanced and wide-ranging to ensure the different risks and vulnerabilities associated with gender, age, ethnicity, migratory status and other characteristics are effectively identified and tackled in urban welfare programming.

3.10.2. Comprehensive and integrated design of urban social protection is key

The complexity, multidimensionality and interconnectedness of urban poverty and inequality require a comprehensive

Figure 3.14. The A, B, C and D of urban social protection design



Source: Adapted from Gentilini, 2015.

social protection system that goes beyond income. Cities and subnational government must invest in comprehensive social protection systems, which guarantee income security and a wide range of services for vulnerable groups. Additionally, cities should see themselves as part of a continuum of national social protection systems where they are part of the broader and interconnected interactions between rural, peri-urban and urs ban areas of various sizes. The COVID-19 crisis has exposed the dangers of not having social protection systems that cushion vulnerabilities across territories, thus demonstrating the need to integrate social assistance, insurance and labour market interventions in coherent and connected ways across the urban-rural continuum.[136]

3.10.3. Innovative financial mobilization and revenue generation

Transformative and ambitious policy interventions require huge financial commitments. To successfully implement social protection programmes, city governments in many countries will have to increase their revenue streams. Depending on the context, city governments will need to diversify their portfolio of revenue, improve capacity for revenue generation and harness innovative financing mechanisms. Chapter 4 provides insights on how cities can diversify their economies and expand their fiscal opportunities. Cities can also pay to extend basic services and infrastructure to marginalized communities by tapping into fees paid by the rich. For instance, in Ouagadougou, Burkina Faso, the municipality uses fees paid by high-income households to improve wastewater infrastructure and support safe on-site sanitation for low-income households.[137] Cities should also develop appropriate incentive schemes to engage with the private sector and underserved markets in order to adopt new financing mechanisms that can fund the projects cities need most urgently. For cities to mobilize innovative revenue sources, they will require fiscal autonomy within an effective decentralized framework.

3.10.4. Governance and institutional reforms

Cities do not exist in isolation; those in poor countries lack the capacity, jurisdiction and resources to implement these bold and transformative measures. The transformative power of cities should be strengthened through a sustained, shared vision among diverse local stakeholder groups, including

representatives of international or multilateral agencies operating locally. A governance challenge facing urban-specific social protection is that the New Urban Agenda devolves much of the responsibility for delivering services to local governments, while social protection is usually implemented at a national level. A multilevel governance approach is therefore crucial for the implementation of urban social protection. National governments should promote policies and institutional reforms that enable the fiscal capacities of cities to implement these ambitious transformative measures.[138] Additionally, the design and implementation of social protection programmes and policies should meet specific urban needs in a coordinated national protection system.[139]

3.10.5. The role of political marketing

Political marketing is critical for successful urban social protection. It is important to frame social protection within an optimistic urban development narrative to facilitate policy uptake in the future. Policymakers at the city and subnational levels are sometimes sceptical about cash transfers or other forms of social protection in urban areas. Proponents of urban social protection programmes must address opposing views such as concerns that these programmes will create a dependent class disincentivized to work and induce urban congestion by encouraging migration to cities. Such biases pose a key challenge for the institutionalization of urban social protection programmes. Thus, it is important to frame these policy measures differently. For example, designating social protections as part of a broader suite of urban public works can draw support from local political leaders.[140]

3.10.6. Investment in evidence-based targeting

Successful urban social protection programmes target key constituencies, but such efforts must be evidence driven to reach the most vulnerable urban populations. Targeting eligible urban populations raises challenges that are often not present in rural areas. Geographical and categorical targeting can be complicated by the varying spatial dimensions of urban poverty and inequalities, and lack of current information on the spatial distribution of poverty. The poor are usually clustered in specific geographical areas in some cities and widely dispersed in others. Local governments should identify so-called "pockets of poverty" so that geographical targeting becomes effective in reaching the most vulnerable populations.[141]

Cities cannot adequately address challenges that are poorly understood when they have limited data on the needs, priorities and vulnerabilities of the local population. These data gaps often lead to poorly designed and ineffective policy responses. Cities should utilize new technologies, such as satellite imagery and geospatial mapping, for better and more nuanced local insights on poverty and inequality.

3.10.7. A rights-based approach to urban social protection

Social protection systems are most likely to deliver on their transformative potential if they are rooted in foundations of human rights.[142] Adequate legal and institutional frameworks help social protection to be seen as an inherent social entitlement or right, rather than as mere charity, for the most vulnerable populations. A rights-based approach to social protection that follows two basic principles is important. First, universalize social assistance to highly vulnerable urban populations; and second, universalize social protection insurance to all workers including those working informally. For example, Austria's comprehensive system of social security, which includes both contributory and non-contributory social protection programmes, is rooted in international and regional human rights instruments. Austria considers social policy "a key instrument in tacking poverty and improving chances in life."[143]

3.10.8. Mainstreaming social policy objectives into national and local policies and plans

The design and reform of social protection programmes should be complemented with comprehensive review of macroeconomic policies to mainstream socioeconomic objectives such as urban poverty and inequality reduction into city development plans and policies. Until recently, urban poverty and inequality have hardly featured in the macroeconomic policy of many developing countries. Governments should have poverty reduction and economic development plans that set priorities for cities. Furthermore, cities should strengthen the link between urban policy and social protection; for instance, most of the risks faced by informal sector workers stem from their exclusion in urban development policies and plans.

3.11. Concluding Remarks and Lessons for Policy

This chapter has shown that poverty and inequality could become persistent features of the future of cities in both developed and developing countries if governments and stakeholders at all levels do not take decisive actions. The COVID-19 pandemic laid bare the structural inequalities inherent in urban areas, exacerbated poverty, exposed

hidden pockets of poverty, amplified existing vulnerabilities and created new ones and in ways that have placed additional burden on already overstretched local governments, especially in developing countries. The impacts of the pandemic were severely devastating for the marginalized and most vulnerable groups including the homeless, indigenous peoples, refugees and migrants and internally displaced persons, slum dwellers and those working in the informal economy.

Whether urban poverty and inequality will become entrenched and pervasive features of cities will undoubtedly be determined by decisions and actions taken by city leaders today. Without urgent and transformative policy action at all levels, the current situation will only worsen. The long-term costs of each incremental policy choice may not be clear, but each decision could shape the future of cities for generations to come. Wrong decisions by city leaders could entrench poverty, deny opportunity for millions and widen urban disparities in ways that will become increasingly difficult to reverse or rectify.

For inclusive and equitable urban futures to be realized, the chapter emphasized the following key policy areas:

- Adoption of a multidimensional approach to addressing urban poverty and inequality through investing in both hard and soft infrastructure can address the multiple spatial, social and economic barriers that lead to exclusion and marginalization.
- Extending infrastructure and basic services to underserved communities can be a catalyst for inclusive and equitable urban futures.
- Recognizing and supporting informal sector workers through tailored social protection programmes and responsive urban planning and policies is critical for tackling poverty and inequality.
- Inclusive and gender transformative approaches are urgent for building equitable urban futures.
- Urban sensitive social protection is a potentially powerful policy tool for redistributing wealth and addressing poverty and inequalities.
- Place-based interventions can build the resilience of “urban weak spots” such as slums and informal settlements.
- The New Urban Agenda provides a framework for all facets of sustainable urbanization to promote equality, welfare and shared prosperity. Cities should mainstream these commitments in their local development plans with deliberate focus on addressing urban poverty and inequality. Eradicating poverty and reducing inequality in all forms remain a cornerstone to ensure that cities are better prepared for the next crisis.

Endnotes

1. Bandauko et al, 2021.
2. UN-Habitat, 2018c.
3. UN-Habitat, 2020a.
4. UN-Habitat, 2020a; UNDESA, 2020.
5. UNDESA, 2020b.
6. Khan, 2020.
7. Bandauko et al, 2022a, A systematic review of gated communities...
8. Bandauko et al, 2022b. They say these are places for criminals...
9. Serin, 2019.
10. World Bank, 2018a.
11. Sachs et al, 2021.
12. Hughes et al, 2021.
13. Hughes et al, 2021.
14. Lakner et al, 2020.
15. UNDP and Oxford Poverty and Human Development Initiative, 2021.
16. UNDP and Oxford Poverty and Human Development Initiative, 2020.
17. UNDP and Oxford Poverty and Human Development Initiative, 2020.
18. World Bank, 2020b.
19. Nguyen et al, 2020.
20. Lakner et al, 2020.
21. Sanchez-Paramo, 2020.
22. United Nations, 2020d.
23. Gradín et al, 2021.
24. Sánchez-Ancochea, 2020.
25. Oxfam, 2021.
26. United Nations, 2020d.
27. Gradín et al, 2021.
28. World Bank, 2022c.
29. Fisher-Post, 2020.
30. Lord, 2020.
31. Khan, 2020.
32. Jean Claude, 2020.
33. Mahendra et al, 2021.
34. UNICEF, 2020.
35. UNICEF, 2020.
36. Chilkoti, 2021.
37. Fund for Peace, 2021
38. UN-Habitat, 2020a.
39. World Bank, 2018a.
40. World Data Lab, 2022.
41. Wang et al, 2020.
42. Kidokoro et al, 2021.
43. Moloney, 2020.
44. ECLAC, 2021.
45. Muggah, 2018.
46. UN-Habitat, 2020a.
47. UN-Habitat, 2020a.
48. Arimah, 2010.
49. World Bank, 2018a.
50. Bandauko et al, 2022c.
51. Elgendy and Abaza, 2020.
52. Cities Alliance, 2022.
53. Dachaga and de Vries, 2021; World Bank, 2020c.
54. Habitat for Humanity International, 2021.
55. Mahendra et al, 2021.
56. Mahendra et al, 2021.
57. Mutinda et al, 2020.
58. ILO, 2018.
59. ILO, 2020.
60. ILO, 2021b.
61. Muggah and Florida, 2020.
62. Akter et al, 2021.
63. World Bank, 2020d.
64. Mahendra et al, 2021.
65. Chu et al, 2019.
66. Byers et al, 2018.
67. Bangalore et al, 2019.
68. Cities Alliance, 2021c.
69. United Nations 2021b.
70. UN-Habitat, 2021a.
71. UN-Habitat, 2021a.
72. Khan, 2020.
73. Lall and Wahba, 2020.
74. Mack and Wrase, 2017.
75. Mack and Wrase, 2017.
76. Schinnerl and Greiling, 2019.
77. Schinnerl and Greiling, 2019.
78. Tribuna Economica, 2019.
79. Maley, 2019.
80. UN-Habitat, 2020a.
81. UN-Habitat, 2020a.
82. Sánchez-Ancochea, 2020.
83. UN-Habitat, 2020a.
84. UNICEF, 2020.
85. Shaban and Aboli, 2021.
86. Mahendra et al, 2021.
87. UN-Habitat, 2020a.
88. UN-Habitat, 2021a.
89. Armah et al, 2018.
90. Cities Alliance, 2021a.
91. Mahendra et al, 2021.
92. Mahendra et al, 2021.
93. Mahendra et al, 2021.
94. Mahendra et al, 2021.
95. OECD, 2016.
96. Bach, 2020.
97. Poethig et al, 2018.
98. Joint Research Centre, 2019.
99. Joint Research Centre, 2019.
100. Haandrikman et al., 2021.
101. Lanza and De Martino, 2022.
102. UN-Habitat, 2021a.
103. Mahendra et al, 2021.
104. Mahendra et al, 2021.
105. UNESCO, 2016.
106. World Bank, 2020c.
107. Mahendra et al, 2021.
108. Chen and Beard, 2018.
109. Mahendra et al, 2021.
110. Sverdlik and Walnycki, 2021.
111. Sverdlik and Walnycki, 2021.
112. Das and King, 2019.
113. King, et al, 2017.
114. Community Organizations Development Institute, 2018.
115. Mahendra et al, 2021.
116. UN-Habitat, 2021a.
117. UNDESA, 2018b.
118. Resilience and Innovation Learning Hub, 2020.
119. Cities Alliance, 2021b.
120. UN-Habitat, 2021a.
121. Devereux, 2021.
122. Cuesta et al, 2021.
123. Cuesta et al, 2021.
124. Cuesta et al, 2021.
125. WFP, 2020.
126. Mahendra et al, 2021.
127. Watt, 2017.
128. Triveno, 2016.
129. Bredenoord et al, 2014.
130. Mahendra et al, 2021.
131. King et al, 2017.
132. Mahendra et al, 2021.
133. Feltenstein and Dalta, 2020.
134. Mitlin et al, 2019.
135. Gentilini et al, 2021.
136. World Bank, 2021a.
137. Mahendra et al, 2021.
138. Annan-Aggrey et al, 2021
139. Gentilini, 2015.
140. Gentilini et al, 2021.
141. Cuesta et al, 2021.
142. UNRISD, 2016.
143. Federal Ministry of Labour, Social Affairs and Consumer Protection, 2014.

Bangladesh, Dhaka, BRAC, Bijoy Sarani Railway Slum,
©UN-Habitat/Kirsten Milhahn

Chapter 4:

Resilient Urban Economies: A Catalyst for Productive Futures

Quick facts

1. Future shocks that significantly impact urban economies are imminent. However, there are disparities in cities' resilience to face such shocks, with some more prepared than others.

2. The informal economy is still and will continue to be vibrant economic force in urban areas of developing countries. The sector must therefore be recognized and supported as a legitimate contributor to urban economies through a wide range of inclusive policies and targeted programmes.

3. Well-planned and managed urbanization is a transformative force towards sustainable and inclusive growth in the future of cities.

4. The COVID-19 pandemic has unleashed an unprecedented crisis resulting in massive job losses, shrinking local revenues and contraction of urban economic growth. This experience demonstrates the urgency of building resilient urban economies for the future.

5. Cities in developing countries are experiencing rapid urbanization without structural transformation, thus failing to reap productivity gains, which make them highly vulnerable to future shocks.

Policy points

1. Cities should prioritize economic diversification as a critical pillar for building resilient urban economies and productive urban futures in line with the New Urban Agenda.

2. Sustainable urban and territorial planning supported with effective governance structures is critical for building resilient urban economies and productive urban futures.

3. Urban economies are more productive in peaceful and stable societies.

4. Governments should implement targeted interventions such as tailored social safety nets to strengthen the capabilities of marginalized groups.

5. Sustainable and innovative municipal finance are fundamental for optimistic urban futures.

Cities are significant accelerators of economic growth, contributing more than 80 per cent of global gross domestic product (GDP). Due to agglomeration effects and economies of scale, cities generate substantial economic activity and wealth, with tangible benefits for urban residents. For instance, in Africa, one can earn as much as 23 per cent more in cities than in rural areas.[1] This kind of income boost is a clear pointer that, if well-managed, urbanization can be a transformative force for sustainable growth that increases the productivity of cities and drives local economic activity.

The New Urban Agenda encourages governments to prioritize sustainable and inclusive urban economies by leveraging the benefits associated with well-planned urbanization processes.[2] The NUA also envisages cities that are adequately prepared to meet the challenges and opportunities of present and future; cities that generate inclusive and sustainable economic growth, including recognition of the informal economy.[3] Moreover, SDG 8 calls for nations to pursue inclusive and sustainable economic growth as well as employment and decent work for all, trends that will be driven by outcomes in urban areas. These calls to action from the global development agenda show how urban economic prosperity is a pillar of achieving the ambitions set out in the SDGs and the NUA, as well as helping the world recover from the economic crisis caused by the COVID-19 pandemic.

Historically, cities have always been vulnerable to economic shocks and stresses. The global financial crisis of 2008–2009 impacted cities by reducing demand for manufactured goods and exports, worsening unemployment, disrupting housing markets, reducing public revenue and overall contracting local economies.[4] But that crisis pales in comparison to the current pandemic; the COVID-19 crisis has unleashed an unprecedented stress test on urban economies, even highly competitive ones. Melbourne, Australia, for example, is projected to see a cumulative reduction in gross product of up to AU$110 billion and stifled job growth from the onset of the pandemic to 2024, with up to 79,000 fewer jobs created than pre-COVID forecasts.[5]

the COVID-19 crisis has unleashed an unprecedented stress test on urban economies, even highly competitive ones

The economic impact of the pandemic is reverberating across regions. For instance, before the pandemic, per capita GDP in the Middle East and North Africa (MENA) region was estimated to be US$14,000, but this figure dropped to US$13,000 in 2020. Estimates show that regional economies in MENA could take until 2024 or 2025 to bounce back to pre-pandemic levels,[6] with cities being the hardest hit. In Europe, the regional economy contracted by 5.9 per cent in 2020.[7] In England and Wales, for example, urban areas could have accounted for 60.4 per cent of the total job losses due to pandemic-induced economic shocks.[8]

The economic impact of the pandemic has been variegated across the world owing to differences in the resilience of urban economies, economic structure of different urban areas, the fiscal health of various levels of government and social protection measures, among others. In developing regions, workers in the informal economy have borne the brunt of economic contraction and massive job losses, complicating their ability to rebuild their livelihoods. In developed countries, the pandemic's economic impact disproportionately affected marginalized groups such as minorities, migrants, indigenous peoples and the homeless, among others (Chapters 1 and 3). For example, migrants in European urban economies work with limited job security and without legal status, making them vulnerable to income losses in times of crises, especially sectors in which migrants were overrepresented.[9]

The pandemic also inflicted strain on the fiscal health of cities and countries. Globally, local governments were expected to have 15 to 25 per cent less revenues by 2021.[10] With weakened fiscal capacity and growing pressure on public finances, local governments may struggle to invest in key infrastructure and services—critical pillars for thriving urban economies and productive urban futures. Additionally, the pandemic has not only slowed down investment into and progress towards SDG 8 on decent work and economic growth, it has also left countries grappling with inflation well above their monetary policy targets.[11] The tightening of global financing conditions in the face of rising inflation is projected to put more countries at risk of debt distress, further constraining their fiscal space and impeding economic growth. Already, current estimates indicate that 60 per cent of least developed and other low-income countries being at high risk of, or in, debt distress.[12]

As the world transcends the pandemic, the inflationary pressures have been exacerbated by both ongoing global supply chain disruptions and the war in Ukraine. Besides

A market in Georgetown, Guyana © Kirsten Milhahn/UN-Habitat

massive loss of life and displacement of persons, the conflict in Ukraine has further increased the ongoing disruptions to global logistics and supply chains. Additionally, since the region is a significant contributor to global food and energy supplies, the conflict is also shaking energy markets—driving up oil and fuel prices globally—and worsening food insecurity, increasing further uncertainty in the global economy already battered by COVID-19 crisis.[13]

The World Cities Report 2020 highlights how the COVID-19 pandemic provides an opportunity for policymakers to reimagine how cities can build the resilience of their urban economies to reduce their vulnerability to future shocks and stresses. Without concerted efforts at all levels of government to manage the COVID-19 crisis and recovery, the pandemic would continue to undermine the economic structures of cities and increase the level of risk aversion among businesses and depress urban investment in the long run.[14] The pandemic and the emerging shocks could set the productivity of cities on a downward spiral with dire consequences on the collective vision of inclusive, equitable, resilient and productive urban futures. The multiple impacts of the recent shocks on urban economies demonstrate the urgency of investing in integrated resilient interventions, taking into account the economic needs of most vulnerable groups.

This chapter explores the pathways to resilient urban economies and productive urban futures. It analyses how the urban economy can be strengthened to withstand future shocks and crises, while examining how the urban economy can be fully fit for purpose to withstand these shocks. Additionally, the chapter discusses new innovative sources of revenue that cities can leverage for sustainable urban futures. Finally, the chapter explores the different ways city authorities can support the informal sector to achieve inclusive growth. As a prelude, the chapter introduces the concept of urban economic resilience, including its strategic pillars and how these relate to both cities of developed and developing regions. The state of urban economies in both developing and developed regions is then discussed, including implications for the future of cities. The chapter ends by discussing the transformative pathways towards resilient urban economies and productive urban futures.

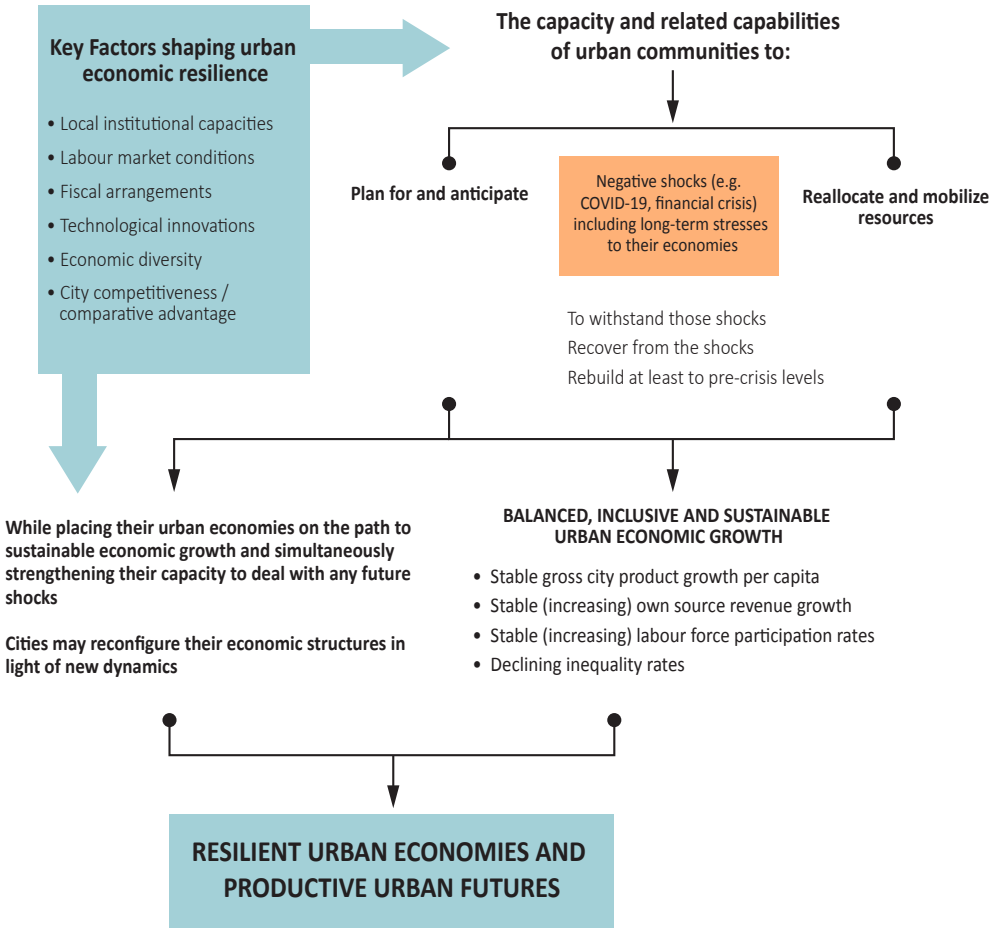
4.1. Conceptualizing Urban Economic Resilience

Urban economic resilience refers to "the capacity and related capabilities of cities or urban communities to plan for, anticipate negative shocks, including long-term stresses, to their economies, allocate, reallocate, and mobilize resources to withstand those shocks, recover from the shocks, and rebuild at least to pre-crisis levels, while placing their economies on the path to sustainable economic growth and simultaneously strengthening their capacity to deal with any future shocks" (Figure 4.1). [15] A resilient urban economy must be able to withstand and recover from shocks such as financial and economic crises (Chapter 10).

Cities with strong economic resilience usually have the resources and institutional capacity to implement adaptive changes and diversifying into new economic sectors, thereby making their local economies agile.[16] Existing evidence suggests that economic diversity can contribute to urban economic resilience while sectoral specialization and export concentration are likely to be more vulnerable to economic shocks.[17] The COVID-19 pandemic has exposed these realities; specialized

Cities with strong economic resilience usually have the resources and institutional capacity to implement adaptive changes and diversifying into new economic sectors, thereby making their local economies agile

Figure 4.1: Conceptualization of urban economic resilience



Source: Adapted and modified from UN-Habitat and UNCDF, 2021.

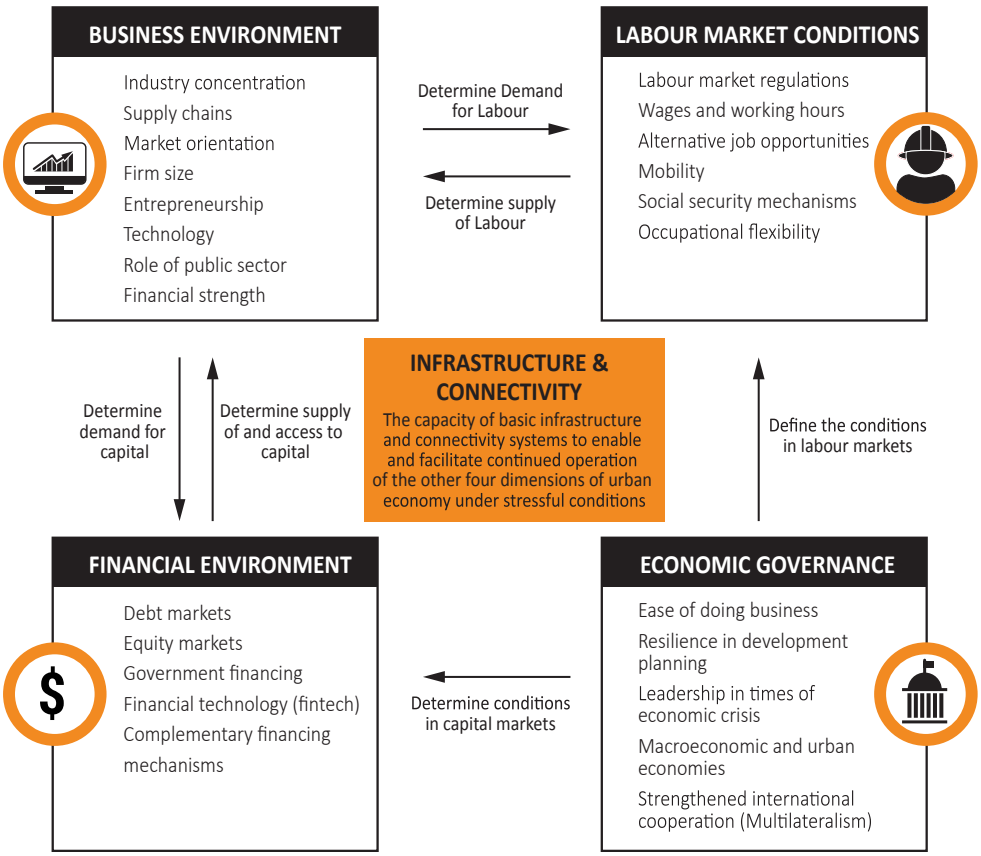
urban economies such as those who relied more on tourism and export markets were severely impacted due to restrictions in movement and supply chain disruptions. On the other hand, diversified urban economies capitalized on their innovation capacities and creative human capital in order to adapt to the new economic order necessitated by the pandemic.

As indicated in Figure 4.1, the overall objective of urban economic resilience is to achieve balanced, inclusive, and sustainable development as measured by indicators such as gross city product (GCP) growth, labour force participation rate, inequality rates and per capita gross city product and per capita revenue. Ultimately, an increase in GCP per capita, labour force participation rates and own source revenue per capita coupled with a decrease in inequality will improve the well-being of urban residents.

an increase in GCP per capita, labour force participation rates and own source revenue per capita coupled with a decrease in inequality will improve the well-being of urban residents

Urban economic resilience is also multidimensional: its key pillars include business environment, economic governance, labour market conditions and financial arrangements (Figure 4.2). Business environment and economic governance refer to urban systems and describe, respectively, conditions for business operations (both public and private), the structure of local economies, as well as rules and regulations that govern the activities of businesses. Labour market conditions and financial arrangements refer to factor markets (labour and capital, respectively) in urban areas. Together these four pillars are critical for building resilient urban economies and productive urban futures, but their manifestation varies geographically.

Figure 4.2: Key dimensions of resilience building for urban economies



Source: UN-Habitat and UNCDF, 2021.

The informal economy and small and medium-sized enterprises (SMEs) constitute a key part of the business environment in developing country cities. On the other hand, the business environment in cities of developed countries is mostly characterized by larger firms in the knowledge industries, advanced producer services, advanced manufacturing sectors and creative industries, among others. When compared to developing countries, urban economies in developed countries are also backed by diverse labour market conditions, with highly skilled workers that can easily adapt to changes in local economies. These characteristics create favourable conditions for stronger agglomeration economies and productivity enhancing gains—making developed cities more resilient to shocks than their counterparts in developing regions.

Developed and developing country cities vary significantly in terms of the mechanics of their economic governance. For instance, most cities in developed countries usually have explicit economic development plans, policies and strategies, which are often executed. In comparison, most cities in developing regions are operating in a context where urban policy formulation needs improvement and implementation remains a hurdle. This difference in policy contexts is reflected in disproportionate experiences in responding to shocks and channelling resources towards resilient urban economies. Compared with developing countries, developed country cities have vibrant debt, equity and capital markets, which facilitate access to reliable financing instruments to fund urban programs. As illustrated in Figure 4.2, infrastructure and connectivity systems are central to facilitate the functioning of the other four dimensions of the urban economy under stressful conditions. In building urban economic resilience, these key pillars should be considered in an integrated and holistic way.

infrastructure and connectivity systems are central to facilitate the functioning of the other four dimensions of the urban economy under stressful conditions

4.2. Urban Economies of Cities in Developing Countries

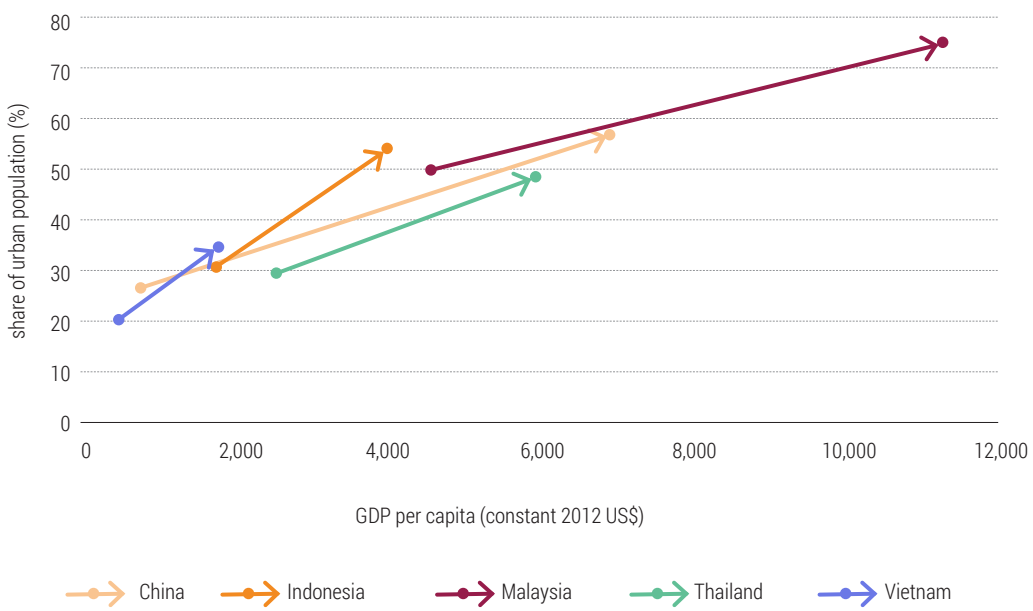
This section examines the state of urban economies in cities of developing regions, with particular focus on (i) structure of urban economies, (ii) the structure of the informal economy and its contributions, (iii) the nexus between urban planning and urban economies, (iv) dynamics of unbalanced urban and territorial economic development and (v) municipal financing, among other aspects of the economic well-being of cities. The implications of these issues for urban economic resilience and productive urban futures are highlighted, as are areas requiring specific policy attention moving forward.

Street bazaar in Cairo, Egypt © leshiy985/Shutterstock

4.2.1. Economic structure of developing country cities and implications for the urban future

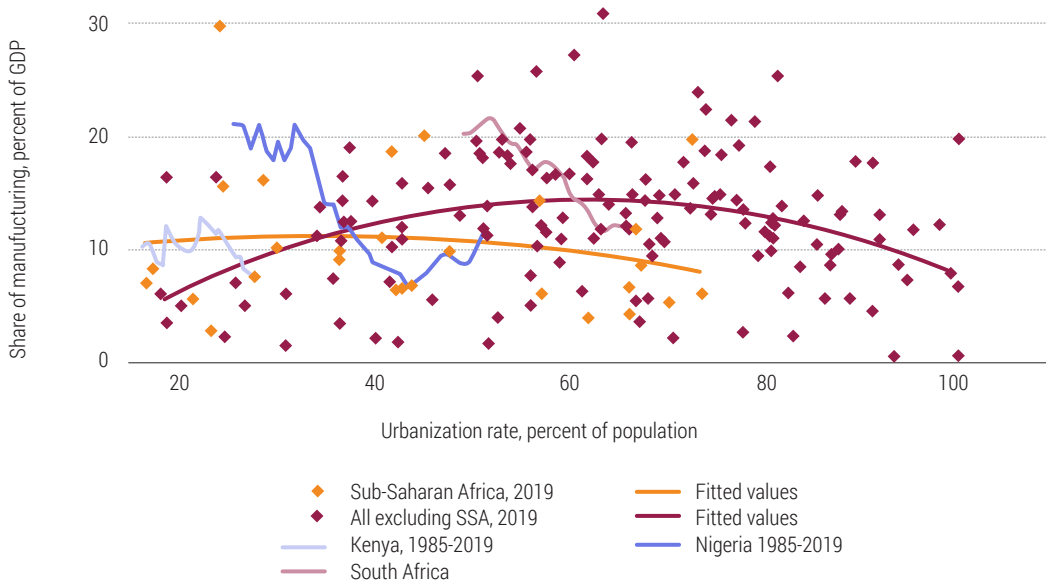
Countries with similar urbanization trends might nevertheless have varying urban economic structures.[18] Economies of agglomeration are stronger in the manufacturing and high-skilled service sectors, which exist in most Eastern Asian and Latin American cities but are less common in Sub-Saharan Africa (SSA) or the Middle East and North Africa (MENA).[19] In Eastern Asia, some countries such as China, Malaysia and Thailand have been relatively successful in leveraging the benefits of urbanization by generating higher productivity jobs (Figure 4.3).

Figure 4.3: Urbanization and growth in selected Eastern Asian countries



Source: Page et al, 2020.

Figure 4.4: Urbanization without economic transformation in Africa



Source: Grover et al, 2022.

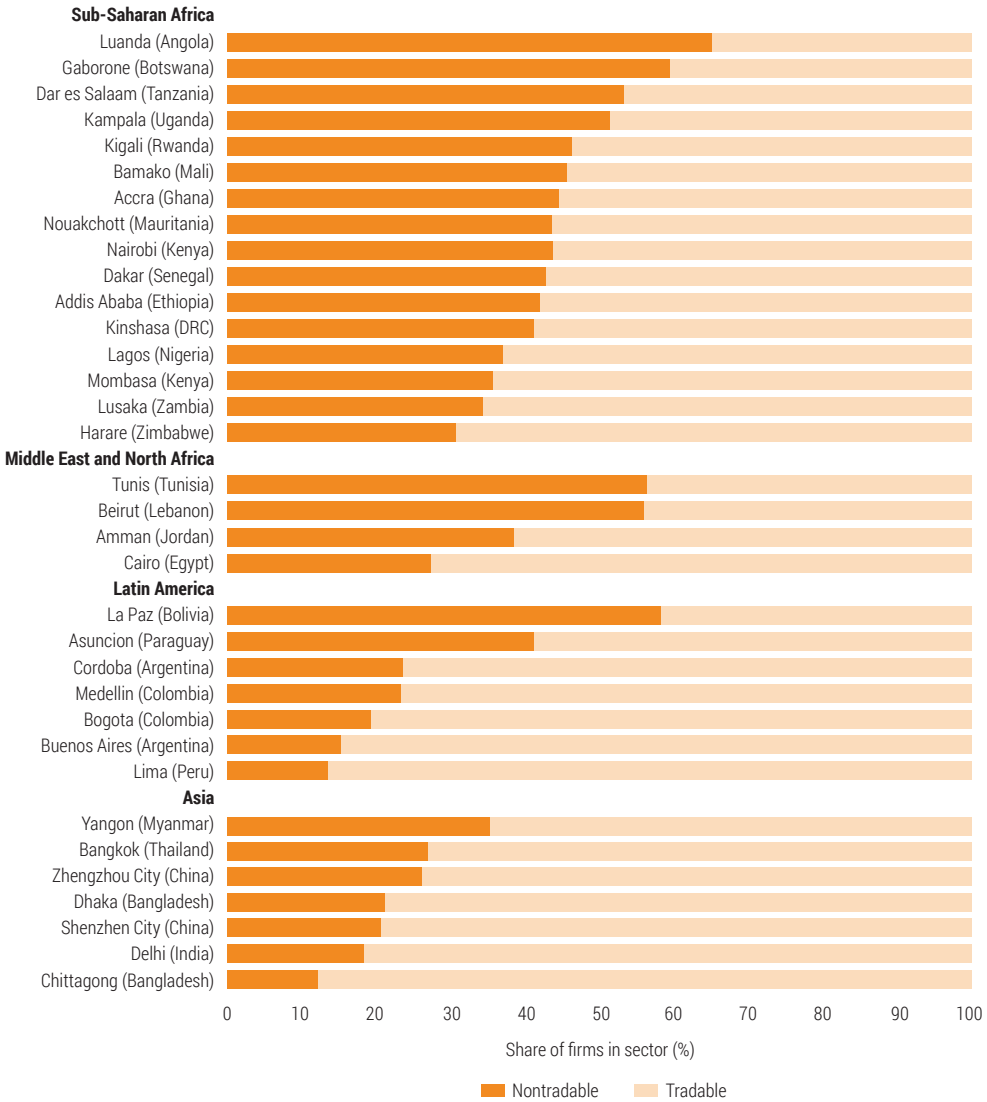
In Sub-Saharan Africa, urban economies tend to be undiversified with a limited manufacturing sector and small firm sizes. Some countries are experiencing rapid urbanization without structural transformation of their city economies, which amplifies their vulnerabilities to future shocks. These dynamics have reduced the ability of governments to promote vibrant manufacturing as a driver of sustainable economic growth.[20] Mauritania, for instance, despite being one of the most urbanized countries in the region, exhibits the possibility of a weak link between urbanization and growth; the country's economy remains largely reliant on natural resources. In this so-called "incomplete urbanization" scenario, the process of urbanization is not commensurate with parallel increases in GDP per capita.[21] Simply put, Mauritania has not benefitted from the economic dividends that typically accompany urban growth. Similarly, Nigeria and South Africa have seen their shares of manufacturing in GDP decline even while they experienced rapid urbanization (Figure 4.4).[22]

Despite urbanization being a key feature of structural change, in most African cities, a majority of the urban population currently does not have access to productive jobs.[23] In Mozambique, Sierra Leone and Tanzania, at least 30 per cent of the urban population are still employed in agriculture.[24] African cities do not fully reap the benefits of agglomeration economies and specialize primarily in producing non-tradable goods and services.[25] Notably, the share of tradable commodities in Asian cities is comparably higher at about 70 per cent, which is 20 percentage points higher than that of African cities (Figure 4.5).[26]

The dynamics in Figure 4.5 also play out in so-called "consumption cities" where a large share of urban workers is employed in non-tradable service sectors (e.g. commerce, transport and government services).[27] Because of their economic structure, consumption cities do not generate significant productivity gains and knowledge spillovers, making them highly vulnerable to future shocks.[28] These dynamics discourage firms and workers from moving to cities where there is no guarantee of enjoying productivity-enhancing benefits.[29] If the current trajectory of urbanization without structural transformation continues, the prospects for resilient urban economies and productive urban futures

Because of their economic structure, consumption cities do not generate significant productivity gains and knowledge spillovers, making them highly vulnerable to future shocks

Figure 4.5: Share of firms in internationally tradable and non-tradable sectors in selected developing country cities



Source: Page et al, 2020.

in developing countries could be significantly inhibited. In Southern Asia, for instance, limited economic diversification as well as poorly organized labour markets are among the key factors that made urban economies highly vulnerable to economic crisis induced by the COVID-19 pandemic. In this region, economic diversification is low or minimal, with near single-industry economies especially susceptible to supply and demand shocks in countries like Bangladesh (garments), the Islamic Republic of Iran (oil) and Maldives (tourism).[30]

Moving forward, there is an urgent need for various levels of governments to rethink their industrial and growth policies so as to promote the development of more complex, high-skill and high value-added sectors to build the resilience of urban economies to future shocks. The MENA region, for example, has longstanding economic structural problems such as low GDP growth, low employment especially among women and youth, low human capital index, a large informal sector, weak investment climate and poor amounts of foreign direct investment.[31] These problems have been amplified by the pandemic and are key impediments to the long-term growth of urban economies. In some parts of the MENA region, urban economies face multiple vulnerabilities beyond low and minimal diversification. These vulnerabilities include high-intensity conflict in Libya and Syria, medium-intensity conflict in Iraq and Yemen, and social fragility in Lebanon, the West Bank and Gaza, among others.[32]

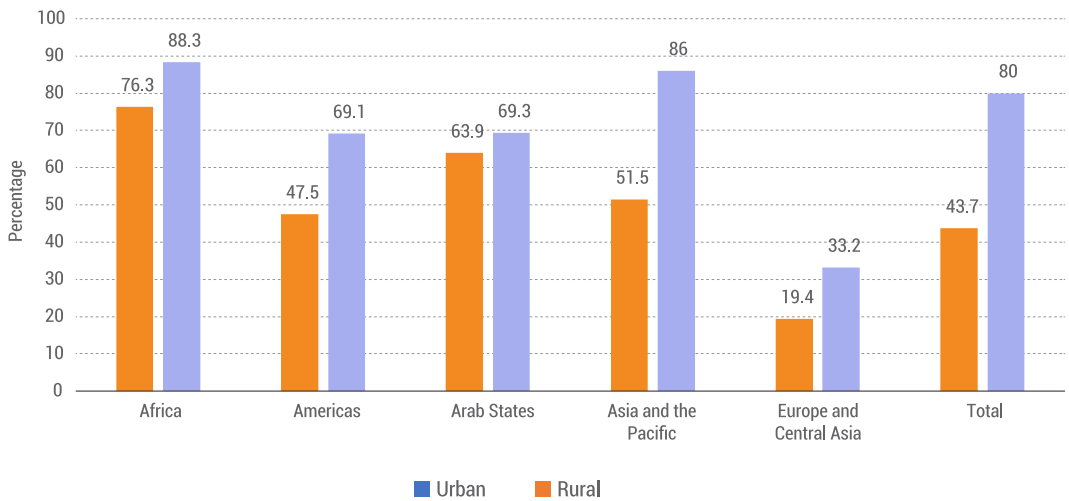
Open air market in Bangalore, India © Shutterstock

Conflicts in this region, as well as other regions across the world, not only result in loss of life, they destroy local economies. The continuation of these conflicts does not augur well for urban economies and productive urban futures. Not only will infrastructure be destroyed, but supply chains will also be continuously disrupted. By implication, urban competitiveness will suffer, and any prospects of domestic and foreign investment will fade. This ultimately will create a vicious cycle where cities in conflict-affected regions will continue to experience disintegration of their economic structure, which has negative repercussions on productive urban futures.

4.2.2. The informal economy and prospects for productive urban futures

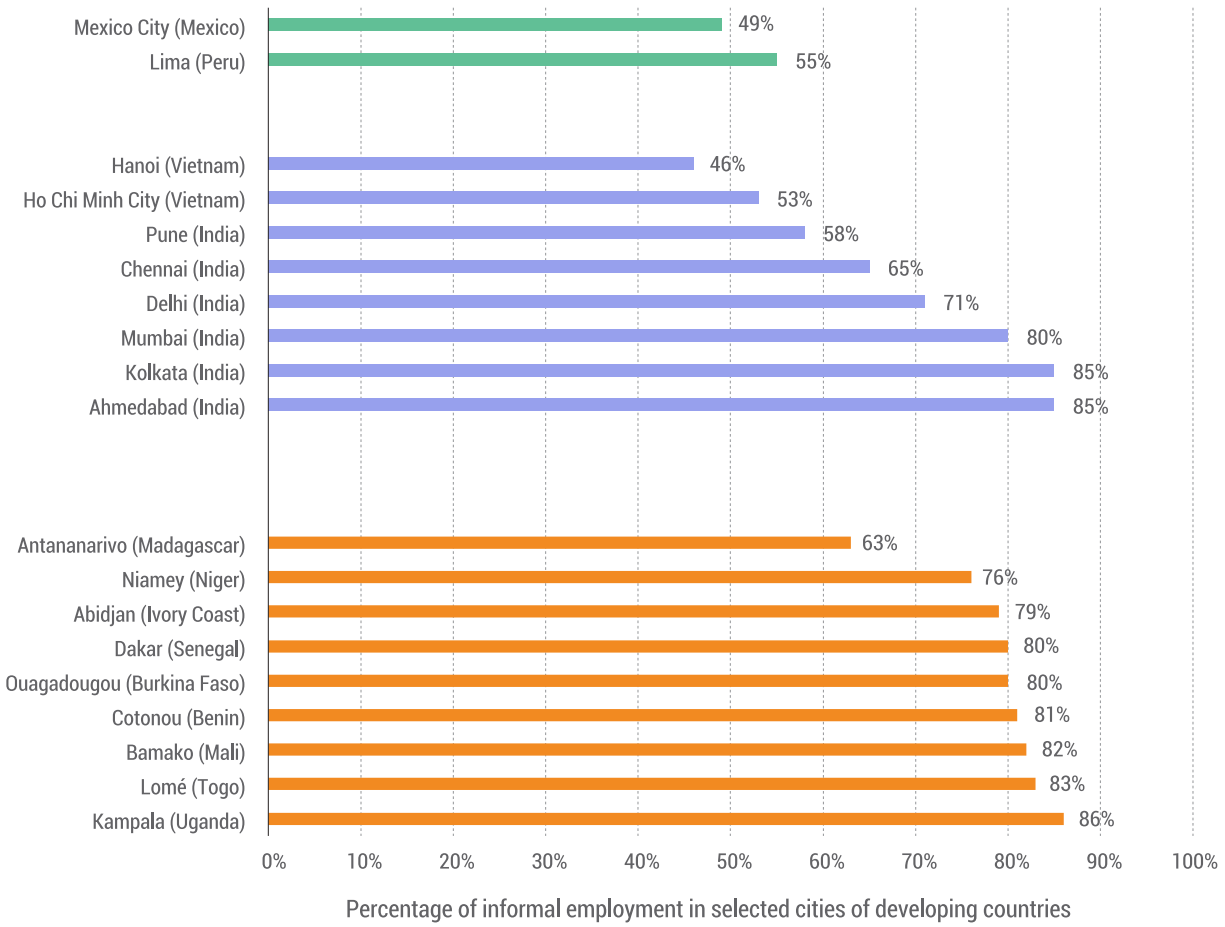
As pointed out in the World Cities Report 2020, the informal economy has become the lifeblood of many cities in developing countries. Indeed, 61.2 per cent of global employment is in the informal sector.[33] In emerging market and developing economies (EMDEs), the informal sector contributes about one-third of GDP and more than 70 per cent of employment.[34] International Labour Organization (ILO) data shows that 85.8 per cent of employment in Africa is informal. In Asia and the Pacific as well as Arab States it constitutes 68 per cent of employment; in Americas, 40 per cent; and in Europe and Central Asia, 25.1 per cent. [35] The prevalence of informal employment is highest in urban areas of Africa (Figure 4.6 and Figure 4.7).

Figure 4.6: Share of informal employment in total employment by area of residence



Source: ILO, 2018.

Figure 4.7: Informal employment in selected developing country cities



Source: Chen and Beard, 2018.

Informal workers from slums also make significant contributions to urban economies in developing countries. For instance, informal waste pickers, a majority of whom are slum dwellers, perform 50 to 100 per cent of waste collection in developing countries. As of 2014, waste pickers in South Africa saved municipalities between R300 million and R750 million per year by extending the life of landfills.[36]

The informal economy still faces structural impediments that affect its productivity. In most cities in developing countries, the informal sector is not recognized as a legitimate contributor to urban economies. Most cities in developing countries deploy exclusionary urban policies to penalize informal workers for their livelihood practices, especially those in public spaces like street vendors. Waste pickers are denied access to waste management contracts and their contribution to the urban economy is undervalued by city planners.[37] The informal economy is almost always perceived as a residual and low productivity sector, and hence receive little or no support in terms of access to infrastructure, finance, social protection systems and markets.

These multiple barriers constrain the productivity of informal workers despite their contribution to the livelihoods of the poor and urban economies. In Sub-Saharan Africa, for example, the productivity of informal firms is estimated to range from one-fifth to one-quarter that of formal firms.[38] This disparity translates to precarious incomes and little contribution to urban economic activity. Informal workers also struggle to accrue adequate savings, thereby increasing their vulnerability to future shocks.

The COVID-19 pandemic has amplified the structural barriers confronting the informal economy, which could further undermine its productivity and contribute to worsening poverty (Chapter 3). Yet, in some cities the

Box 4.1: Informal economy: Surviving, managing, thriving in conflict-affected situations

In fragile and conflict-affected situations, the informal economy provides a dynamic and systemic response to the prevailing challenges as well as opportunities. For many informal workers such as fruit sellers and street food vendors, work continues despite the crises. However, the main challenge is surviving a highly volatile context riddled with urban violence that disrupts transport, supplies and markets.

Time and again, especially in fast-burn crises, a solidarity system of survival emerges in which barriers break down and communities unite to face a common threat. Humanitarian interventions often miss this adaptability, ingenuity and solidarity and thus undermine the potential for self-help, for example in early replacement of basic services lost during the crisis.

For informal workers, growth (e.g. transition to managing enterprises) requires more security, market stability and operating space so that capital investment in supplies and equipment is not wasted. This means rebuilding the complex networks that sustain informal workers and enable them to operate—such as suppliers, transport networks, mobile phones, links to middlemen, and relationships of trust and credit. Here flexibility to adopt blended livelihoods combining income streams from several jobs is critical, but action by local officials as well as security or aid agencies can disrupt these fragile networks. Such networks are also vulnerable to co-option and extortion by criminal gangs. Early intervention to prevent such coercion taking hold is critical.

Some informal enterprises and workers find capacity to thrive in the hostile business environment of crises. These include transport operators supplying aid goods; skilled reconstruction workers; and migrants, internally displaced persons or refugees with access to diaspora networks to support trade and investment. This phenomenon has been vital in the emergence of Somaliland. Refugees, however, face constraints when the legal frameworks in host countries do not support their right to work, condemning them to unofficial income-earning activities.

Lastly, development agencies that focus on economic reconstruction for formal businesses often miss the local economic development potential of the many smaller enterprises which flourish in post-conflict cities, despite unsupportive regulatory frameworks or hostile local government actions.

Source: UN-Habitat, 2019c.

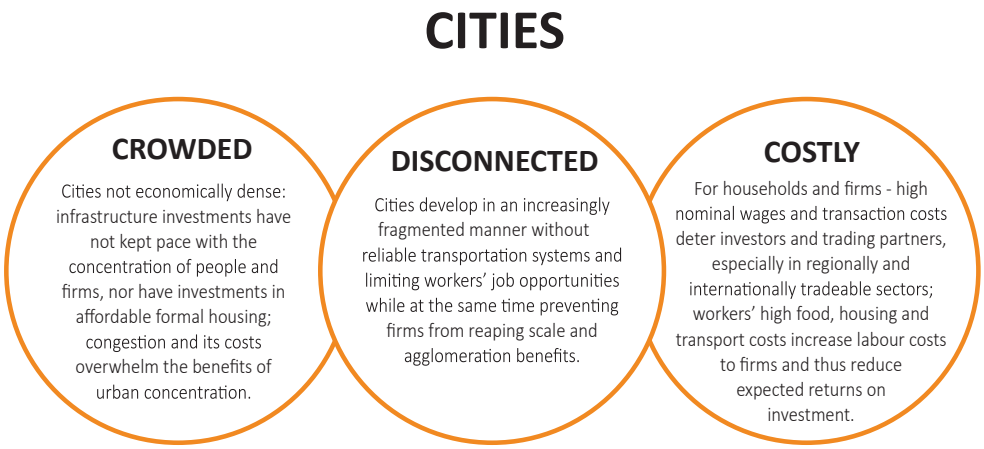
informal economy does not exist in the shadows but rather constitutes the bulk of economic activity. Notably, in fragile and conflict-affected situations, it performs a vital labour-absorbing function through its ability to provide employment opportunities during crises (Box 4.1). Therefore, the challenge for policymakers is how to effectively harness this sector for building resilient urban economies that can withstand future shocks

As we move into the future, cities and subnational governments should implement policies and programs to support transition to formalization and create opportunities for decent and productive employment. Doing so will help achieve SDG 8 the provisions of the New Urban Agenda that call for harnessing the informal economy. Transition to formalization should be backed by tailored support measures such as access to affordable finance, markets and infrastructure to strengthen the resilience of informal enterprises and boost their contribution to productive urban futures and urban economic resilience. Increased productivity of the informal economy could lead to better incomes and reduced poverty levels (Chapter 3). It is likely that the informal economy will expand significantly in the future, thus, urban policies should be developed with this reality in mind.

4.2.3. Poorly planned and managed urbanization undermines productive urban economies

In fast-growing cities, current deficiencies in planning coupled with limited housing supply contribute to the massive expansion of highly crowded informal settlements that are underserved in terms of basic infrastructure and services. These institutionalized deprivations create vicious cycles of low economic growth, low tax revenue bases and subsequent perpetual decline in infrastructure investment and services due to inadequate revenue. African cities are often described as crowded, disconnected, and costly—the

Figure 4.8: The CDC dilemma facing African urban economies



Source: Lall et al, 2017.

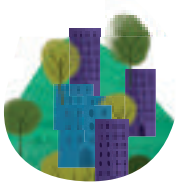
"CDC dilemma" (Figure 4.8).[39] African cities are 23 per cent more fragmented than Asian and Latin American cities,[40] which increases the cost of infrastructure provision. Such cities become less competitive and struggle to attract both domestic and foreign investment.

As shown in Figure 4.8, poorly planned urbanization processes translate to a disconnect between the provision of infrastructure and residential concentrations, resulting in unreliable transport systems. This negatively affects the ability of cities to leverage agglomeration economies of scale.[41]

The CDC dilemma has a negative impact on urban economies due to limited accessibility of opportunities, including limited ability of residents and businesses to access markets, employment opportunities, healthcare (e.g. hospitals) and education (e.g. schools and universities). All of these amenities are critical to urban economic development.[42] For example, heavy traffic congestion and informal transportation systems constrain accessibility to employment in Nairobi. Residents who rely on public transport (minibuses known as matatu) can only access 4 per cent of opportunities within a 30-minute timeframe, as compared with almost double that share (7 per cent) in Buenos Aires, Argentina.[43] Once cities become crowded, they generate massive diseconomies of scale (Chapter 6). Similarly, in Southern Asian cities, poorly managed urbanization creates congestion costs coupled with increased pressure on land, housing and urban services.[44]

This kind of messy urbanization undermines the potential of powerful agglomeration economies to bring about prosperity, which in turn undermines the drive towards productive urban futures. In some developing country cities, authorities have adopted strict land-use controls that limit opportunities for densification. Most African cities, for example, still retain regulatory standards passed on from the colonial era. [45] These land-use policies produce dysfunctional cities by encouraging sprawl rather than compact development.[46] Chapter 2 already lays out the future scenarios of such growth and calls for such spatial growth should be anticipated with sound policies that promote compact development.

Taken collectively, these multiple dynamics create structural impediments for urban economic prosperity and inclusive growth as envisaged in the New Urban Agenda. These conditions undermine the economic productivity and competitiveness of cities, making them unattractive to both domestic and foreign investment. For rapidly growing cities in Asia and Latin America, broader economic policies should provide right incentives for productive and sustainable growth. For example, urban and territorial planning as well as investments in infrastructure should be linked with the objectives of structural transformation (Box 4.2).



messy urbanization undermines the potential of powerful agglomeration economies to bring about prosperity, which in turn undermines the drive towards productive urban futures

Box 4.2: Urban and territorial planning, infrastructure investment and structural transformation

The global view on financing development in low- and medium-income countries is changing, with the focus moving from dispersed grants to supporting major investment in key infrastructure. Flagship programmes that take this new approach include China's Belt and Road Initiative, the European Union (EU)'s Global Gateway, and the Build Back Better World (B3W) initiative of the US and Group of Seven. This shift inevitably raises question about the role of cities and their development in these large infrastructure investment programmes given the territorial dimension of development that underpins any kind of structural transformation in low- and medium-income countries. Linking investment in regional and urban infrastructure to structural transformation of national economies is an important prerequisite to sustainable investment.[47] The EU Global Gateway strategy, for instance, has a strong focus on infrastructure investment that enhances connectivity at different territorial scales. Such a strategy views agglomeration economies as fundamental factors that can kickstart a steady and sustainable process of economic development while also aiming to reduce negative environmental issues and generate higher standards of living for the population.

UN-Habitat, as the urban focal point within the United Nations system, promotes urbanization as a vehicle for economic development for a country, with a clear emphasis that investment in urban infrastructure and services underpins economic transformation. In this regard, pursuing investment in urban development coupled with sound territorial planning as a mechanism to achieve structural economic transformation can lead to more investment synergies in various sectors of economy. Territorial analysis of planned investment in infrastructure and urban development can help achieve coherence of impact for large and medium-size investment projects.

An example of where the United Nations can add value through the territorial dimension of economic transformation is the *Territorial-Industrial Atlas for Investment Attraction: High-potential industries in Mexico* prepared by UN-Habitat and the United Nations Industrial Development Organization in partnership with the Government of Mexico.[48] This novel approach to attract foreign investment is founded on urban and regional planning perspectives.

Lastly, achieving synergies for investments and ensuring coherence of impact can be underpinned by better coordination of public revenue and expenditure (e.g. investing and operating infrastructure) at the national and sub-national levels and including external finance in the complete system of public finance.[49]

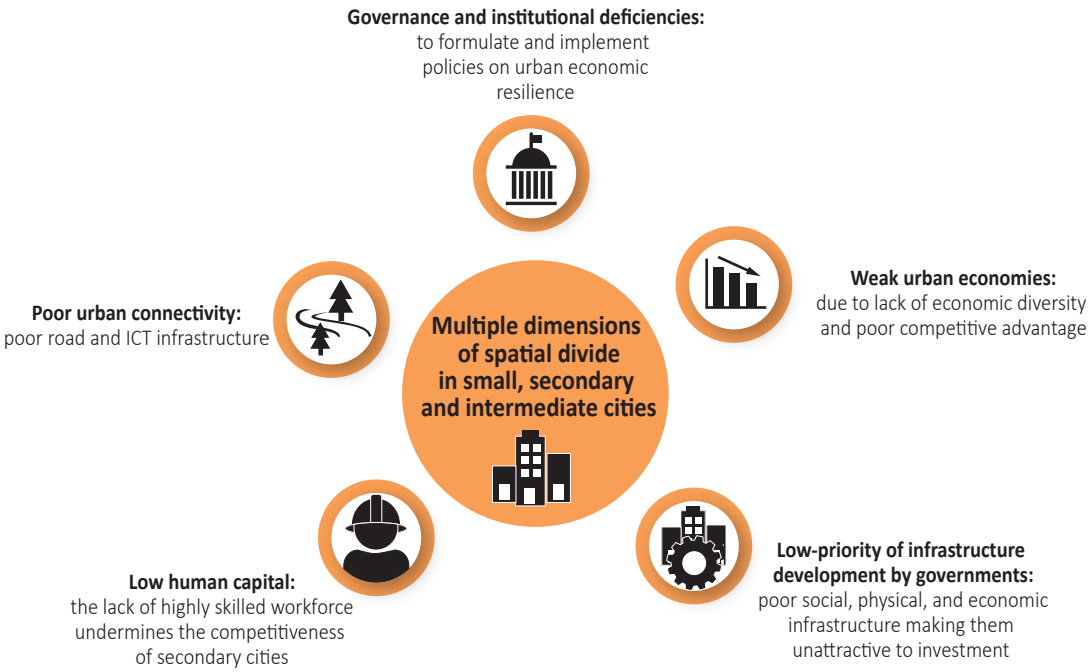
Source: UN-Habitat Office for European Institutions Brussels.

The future of urban economies in developing country cities will depend on the policy decisions taken today. Looking ahead, policymakers at various levels of government must counter the negative impacts of poorly planned and managed urbanization and set their cities towards economic prosperity. If the current unsustainable trends persist, developing countries will continue experiencing underleveraged urbanization and their cities will potentially remain locked in congestion pressures for decades to come. Therefore, national, regional and local governments should ensure that connectivity is enhanced at the city and regional level to alleviate both current and future congestion pressures and facilitate the exploitation of agglomeration economies, thereby enabling the tremendous untapped potential of cities to be realized.

4.2.4. The dilemma of unbalanced urban and territorial economic prosperity

While megacities have long dominated the urban conversation and will continue to play a prominent economic role, most of the future urban growth will occur in small, intermediate and secondary cities.[50] However, economic growth, infrastructure investments and employment opportunities tend to be concentrated in large metropolitan areas. This so-called "big city bias" and winner-takes-all urbanism propels large places to grow economically faster than smaller places, which concentrates development in a small footprint as opposed to allowing for more diffused spatial development across territories. Such asymmetrical development is compounding the urban spatial divide, especially regarding secondary cities—whose population often face multiple deprivations relating to income, employment, health, water,

Figure 4.9: Dynamics of asymmetrical development in secondary cities in developing countries



sanitation and housing (Chapter 3). For instance, in Sri Lanka, both Colombo and the Western Region Megapolis are better connected and have stronger and more diversified economies as compared with other urban centres, which results in regional disparities in economic development.[51]

Figure 4.9 illustrates the dynamics of asymmetrical development in secondary and intermediate cities in developing countries. Because of "big city bias," small, secondary and intermediate urban areas have weak capacities to develop and implement policies on urban economic resilience. Governments do not prioritize investments in infrastructure and services (e.g. water, sanitation, energy, transport and housing) in these small, intermediate and secondary cities. The lack of core infrastructure and services undermine the potential comparative advantage of secondary cities to attract investment and retain skilled human capital. This disinvestment makes their urban economies more easily succumb to future shocks and stresses.

The message emerging from these dynamics is that infrastructure investments and urban planning interventions should not be biased towards megacities.[52] Instead, governments must pay attention to small and secondary cities that might be left behind or otherwise ignored in national and regional economic development strategies. Government at all levels should revamp local infrastructure and services in small and intermediate cities in order to match the future capabilities needed from domestic and foreign firms. Doing so is a response to the call by the New Urban Agenda to support the implementation of balanced territorial development policies, including strengthening the role of small and intermediate cities in urban economic development.[53]

governments must pay attention to small and secondary cities that might be left behind or otherwise ignored in national and regional economic development strategies

4.2.5. Financing urban infrastructure in cities of developing countries

Local and regional governments require significant amounts of financial resources to support their urban economies. In Africa and Asia, estimates suggest that over the next 30 years investments of around 5 per cent of GDP will be required to meet the demand for infrastructure, housing and public services to support rapidly growing urban populations.[54] At the same, most city governments in developing regions face severe barriers to financing key infrastructure investments in line with SDGs, particularly doing so in an inclusive

Figure 4.10: Own source revenue per capita of local governments by country income group (US$)

Source: Based on data from UN-Habitat et al, 2021.

manner that reaches the most vulnerable urban populations (Chapters 6 and 8).[55] Managing own-source revenue systems in developing countries remain a major challenge; low-income countries generate around US$12 per capita per year from own-source revenue in local governments, compared with US$2,944 per capita per year in high-income countries (Figure 4.10: Own source revenue per capita of local governments by country income group (US$)). For example, Iwo, Nigeria; Lucena City, Philippines; and Pekalongan, Indonesia, raise about US$14, US$54 and US$101 per resident per year, respectively.[56] Given the significant investments needed to build sustainable and resilient infrastructures, there is an urgent need to build adequate fiscal capacity.

City governments in developing regions largely rely on intergovernmental transfers, and to some degree their own internally generated revenue (e.g. property taxes, planning and licensing fees), in order to fund capital projects. Intergovernmental transfers account for 90 per cent of local revenues in Kenya, Tanzania, and Rwanda. This figure demonstrates very limited power and capacity by cities to collect their own revenues.[57] Property taxes account for only 20 per cent of financial resources in developing countries.[58]

Trends across regions are a cause for concern with regards to sustainable urban finance. The tax base in Asia-Pacific cities continues to contract, which undermines the ability of city governments to invest in key urban infrastructure.[59] In countries such as Afghanistan, Maldives and Nepal, the central government sets all local revenue rates,[60] undermining the flexibility of municipalities to exploit the potential of their tax bases. In Pakistan, large cities can only mobilize 7 per cent of their financial resources from own-source revenues.[61] Similarly, the collection of property taxes in Latin American countries is a paltry 0.3 per cent of GDP.[62] Cities in developing countries also face constraints in accessing city-level debt as most lack the necessary revenue autonomy and capacity to develop creditworthy projects. Currently, only 20 per cent of the largest 500 cities in developing countries are considered creditworthy, undermining their capacity to fund key urban infrastructure investments.[63]

The COVID-19 pandemic has significantly weakened the fiscal capacity of local governments in developing countries. For example, based on projections early in the pandemic, African cities were expected to lose 65 per cent of their local revenue.[64] If current trends persist, the investment capacities of African cities could be severely devastated, undermining the ability of municipal governments to build resilient urban economies and productive urban futures. In Colombia, there was a 38 per cent nationwide decline in municipal property taxes in the first half of 2020.[65] This unprecedented financial pressure on cities in developing countries may continue or deepen in the post-pandemic recovery phase. Without decisive action, these trends could potentially paralyze cities' capacity to reactivate their economies towards productive urban futures.

Overall, effective urban financing in developing countries depends on more nuanced approaches to fiscal decentralization, as well as the capacity of local governments to mobilize endogenous resources. Collaboration among various levels of government, even if fluid and negotiated, ensures more effective outcomes of investment in urban development.[66] In this context, improving investment planning, strengthening local revenues, and coordinating national, local, and external financing are key policy streams helping improve effectiveness of public and private investment in urban development (Box 4.2). When planned responsibly and based on sound, but not necessarily exhaustive, cost/benefit analysis and supported by adequate regulations, the financing and development of infrastructure can be used as an engine for the development of institutions, policies, and capacities at all levels and across all sectors of governance in these countries.[67]

4.3. Urban Economies of Cities in Developed Countries

This section analyses the structure of urban economies in developed countries, highlighting both strengths and weaknesses and implications for the future of cities. Cities of developed countries have unique features: diversified urban economies, high urban productivity, ageing populations, high value-added sectors, technology driven industries and increased number of shrinking cities among others. The ways in which these characteristics shape the future of resilient urban economies and productive urban futures are discussed, as well as the state of financing for urban economies in developed countries.

4.3.1. Economic structure of developed country cities and implications for the urban future

Urban economies in developed countries are more equipped to bounce back after shocks, as currently witnessed in the case of the COVID-19 pandemic where many hard hit metropolitan areas are now once again showing strong economic indicators. This resiliency is because cities in developed countries have more diversified economic structures, stronger economic foundations, are more resourceful and can quickly deploy policy measures in partnership with national government to revamp their economy. Megacities such as New York, London, Sydney and Paris are primarily "production cities," where most workers are employed in manufacturing or tradable services like finance, business services and creative industries. These cities generate significant productivity thereby putting them in a strong position to attract firms, people and resources.

cities in developed countries have more diversified economic structures, stronger economic foundations, are more resourceful and can quickly deploy policy measures

Overall, urban productivity—measured by the total GDP generated by industry and services divided by total urban population—is high in developed country cities, averaging US$50,000 per capita.[68] Cities like New York and Los Angles, for example, are highly productive because they have larger metropolitan labour markets where workers have access to sizeable, more diversified pool of jobs while firms have access to a larger, more diversified pool of workers[69]—thus, maximizing agglomeration economies.

Large and more diversified labour markets enable firms to withstand both positive and negative shocks by quickly adjusting their labour profiles in light of economic changes. In the Canadian province of Ontario, large and more diversified metropolitan regions such as the Greater Toronto Area (GTA) have a strong economic base to withstand the impact of the failing traditional manufacturing sector.[70] Cities in the GTA are already embracing the new wave of creative and technology-led economies. In Australia, mid-sized towns have diversified their economies beyond their single industrial bases (e.g. mining and manufacturing) to reduce the vulnerability of their urban economies to shocks.[71] During the global financial crisis of 2007–2008, major capital regions in Europe with diversified high-value functions were able to generate more, or at least lose fewer, jobs than their respective country averages,[72] demonstrating agility and resilience to withstand and recover from economic shocks.

Faced with the COVID-19 crisis, European local and regional authorities exhibited varying degrees of vulnerability depending on their economic geographies and their ability to withstand external shocks

Faced with the COVID-19 crisis, European local and regional authorities exhibited varying degrees of vulnerability depending on their economic geographies and their ability to withstand external shocks. Sofia, Bulgaria, with its large share of services, especially in high-tech and trade, was more flexible and less affected by the pandemic-induced economic stress. Overall, unemployment remained below 10 per cent in large municipalities in the country because of opportunities for teleworking, largely supported by better information and technology (ICT) infrastructure.[73] Although most cities in advanced economies are more diversified, there are regional variations. Tyrol and Salzburg, Austria, were significantly affected by the COVID-19 pandemic because their economies are specialized for the tourism industry. Similarly, in Finland, both large and smaller cities dependent on tourism had a comparable experience.[74] These trends demonstrate that overdependence on a single economic sector could potentially set urban economies on a downward spiral in the event of economic shocks.

4.3.2. Shrinking cities and the future of urban economies

Advanced economies, especially those in Eastern Asia, Europe and North America, face the challenge of shrinking cities (see Chapter 2). Shrinking cities are characterized by

Restaurant in downtown Graz, Austria © Anton_Ivanov/Shutterstock

economic downturns and employment outflows, which leave them with predominantly ageing populations who are less adaptable to emerging economic trends.[75] In such cities, jobs in different sectors such as traditional manufacturing and mining are disappearing[76] because of deindustrialization, structural changes in urban economies and shifts in the global economy. For example, the relocation of automobile manufacturing firms to developing countries (e.g. Mexico) was a contributing factor to municipal bankruptcy in once booming manufacturing cities such as Detroit.[77]

Likewise, cities in Eastern Europe and Eastern Asia are shrinking due to a combination of multiple factors, including ageing population, economic restructuring and declining urban economies.[78] In Australia, the loss of employment in mining towns leads to a downward spiral of massive outmigration from once booming mining towns.[79] The loss of skills, knowledge and innovation from shrinking cities has dire consequences for the future of urban economies in these places.

Going forward, in order to encourage the "optimistic scenario" described in Chapter 1, urban leaders in shrinking cities should plan for future growth while anticipating shrinkage by deploying a combination of urban policy and investment instruments to revive urban economies, including embracing the creative and technology-based sectors. Economic diversification becomes urgent to save these places from becoming "ghost cities." If cities continue to experience urban shrinkage without any remedial measures, future economic growth is bound to be curtailed in multiple ways. For example, a rise in vacant buildings reduces the capital value of real estate and creates a diminishing tax base.

4.3.3. Financing urban economies in developed country cities

Advanced countries usually have well-developed capital markets, where debt and equity financing instruments can be deployed to fund ambitious infrastructure projects[80] and provide reliable basic services. Several municipalities have investment-grade credit ratings, typically linked to property-based tax revenues. Cities in advanced economies already leverage debt. For example, the US municipal debt market is worth approximately US$4 trillion.[81] High per capita incomes also mean that many infrastructure investments can generate revenues that enable cost recovery and sustained economic growth.

However, cities in developed countries grapple with investment needs to replace ageing infrastructure like water and sewerage pipelines and new transport links, which often requires billions of dollars. Australia has invested sufficiently over the past several years to meet or exceed their infrastructure needs and will arguably be able to spend less going forward than they have in the past.[82] Conversely, countries such as Germany, the UK and the US face major gaps between their current spending commitments and estimated needs.[83] For instance, New York City has more than 1,000 miles of water pipe that are more than 100 years old.[84]

Despite their advanced economies, the impact of the COVID-19 pandemic on municipal revenues in developed countries has also been catastrophic. Local and regional authorities in the European Union have faced remarkable pressure on their budgets as they make substantial increases in expenditures to sustain their local economies (Table 4.1).

Table 4.1: COVID-19 induced municipal revenue losses in selected European Union countries

EU country	Estimated losses in local and regional authority revenues (in Euros)
France	Estimated net loss of revenue for all local and regional authorities was €5 billion (which constitutes 2.4 per cent of operating income). Municipalities suffered a sharp drop in tariff and tax revenues.
Germany	In 2020, municipalities experienced €6 billion (5.7 per cent) loss in tax revenues compared to 2019; business tax dropped by €5 billion; user fees fell by €1.4 billion (8.8 per cent) in the first half of 2020.
Italy	Estimated €8.4 billion of losses or 23 per cent of 2020 municipality revenues compared to 2019. The biggest loss, €3.5 billion, is from the Single City Tax covering property (-10 per cent) and waste tax (-23 per cent).
The Netherlands	Municipal revenue losses were estimated to be €1.02 billion. About one-third of municipalities entered 2021 with negative budget balance having exhausted their reserves.
Poland	In 2020, large Polish cities experienced €2.4 billion drop in local revenue. Significant losses were experienced in tax revenues mainly from corporate and personal income taxes.
Bulgaria	Overall, total loss in Bulgarian municipality revenue in 2020–2022 would be 30 per cent compared to 2019. This corresponds to €519 million in 2020, €404 million in 2021 and €360 million in 2022.
Ireland	The decline in local revenue was projected to be €228 million (6.4 per cent) of which €78 million was lost from parking charges and planning fees and €150 million from uncollectable commercial property taxes.

Source: Prepared based on data from European Union, 2021.

In the US, the pandemic triggered unprecedented damage to municipal fiscal health. For example, recent projections suggest that 411 Florida municipalities would lose US$5.1 billion from 2019 pre-pandemic levels in fiscal years 2021 through 2023.[85] In 2020, nationwide estimates pointed to a gloomy picture in the US, where cities, towns and villages were projected to face a US$360 billion budget shortfall from 2020 through 2022.[86] However, by mid-2021, some of the cities and states that were facing bankruptcy had cash surplus due federal relief funds.[87] In Australia, Melbourne's lost revenue due the COVID-19 pandemic for the period 2020–2021 is estimated to be AU$83 million.[88]

Cities with diverse revenue and economic structures have a better chance of withstanding external shocks than those that are less diverse in their revenue generating sources. For instance, in the US, cities with both vulnerable economic profiles (greater than 15 per cent share of employment in high-risk industries) and a tax structure that is highly reliant on elastic sources of own revenue (greater than 25 per cent share of general fund revenues) were more impacted by economic shocks compared to those with alternative economic and fiscal structures.[89] With weakened fiscal capacity, various local governments cut investments in infrastructure and key urban services.

Looking ahead, it is critically important for cities and subnational governments to diversify their revenue portfolios by combining both traditional and innovative revenue sources to cushion their fiscal health against future shocks and stresses. At the same time, as illustrated in Box 4.3, tapping resources at the national and supranational levels remain vital to effectively addressing present and future urban challenges and fostering sustainable urban development.

Box 4.3: European Regional Development Fund empowering urban and territorial authorities

The EU Cohesion Policy is at the heart of this funding support and the fostering of strategic, integrated and inclusive approach to address todays' challenges across cities in Europe. Its instruments for the ongoing period 2021-27 follow a dedicated policy objective implemented through territorial and local development strategies. As example of supranational financing, European Regional Development Fund through its instrument of European Urban Initiative supports greater empowerment of local, urban and territorial authorities by transfers of funds for public investment. It will mobilise investments in urban areas: a minimum 8 per cent of the ERDF resources in each EU Member State must be invested in priorities and projects selected by cities themselves and based on their own sustainable urban development strategies. It serves a priority of bringing investment closer to citizens, supporting locally-led development and sustainable urban development across the EU.

Source: European Commission, 2021.

4.4. Towards Resilient Urban Economies and Productive Urban Futures

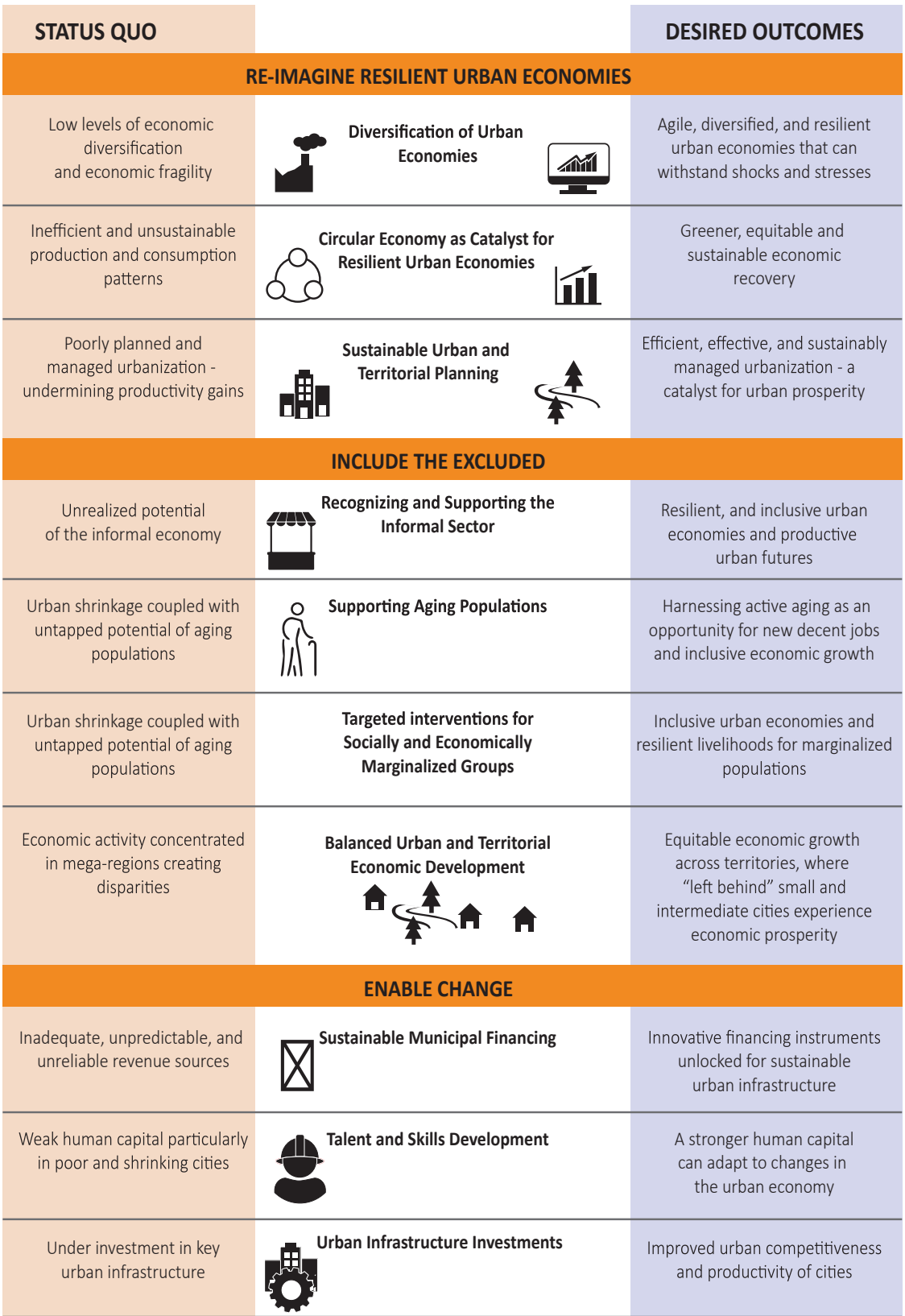
Sustainable and inclusive urban prosperity and opportunities for all is one of the key transformative commitments laid out in the New Urban Agenda. The NUA emphasises that cities and human settlements should be places of equal opportunities, allowing people to live healthy, productive, prosperous and fulfilling lives. In line with this vision, what is needed now and in the coming years is for cities and subnational governments to prioritize building resilient urban economies against future shocks and provide tangible solutions for the whole community—in short, leaving no one behind.[90] Prioritizing resilient investments and interventions that address the root causes of multiple vulnerabilities will generate a triple dividend: help cities boost their local economies, improve equity, and prepare urban communities to withstand future shocks, stresses and risks.

Figure 4.11 illustrates the key transformative pathways to building resilient urban economies and productive urban futures. Cities should reimagine the future of urban economies through economic diversification, transition to circular economies, prioritize sustainable urban and territorial planning, and mainstream resilience in all major urban programs. These resilient interventions and investments should harness the untapped potential of the informal economy and support active ageing to create decent and productive jobs. They should prioritize balanced territorial economic development to ensure that no space is lagging behind. These transformative pathways should be backed by sustainable and innovative financing instruments, resilient infrastructure investments and a vibrant human capital base (Figure 4.11). Urban economic resilience is about recognizing that risks and uncertainties are interconnected, so interventions should be as well.[91]

The implementation of these transformative pathways for urban economic resilience and productive urban futures should be integrated, holistic and coordinated across different levels of government while at the same time addressing challenges related to governance, socioeconomic development, funding and financing. Not every policymaker will find all the transformative pathways appropriate to their context, but some pathways will be. Thus, city leaders should determine the right mix of pathways that are compatible with their context given existing national circumstances, available resources and institutional capacities. Additionally, cities cannot build economic resilience alone. As we move into the future, there is a need for strong coalition building, mobilizing and galvanizing support from different stakeholders such as local and international financial institutions, the private sector, development banks, community and civil society groups, and national government entities.

Amsterdam, Netherlands © Iornet/Shutterstock

Figure 4.11: Transformative pathways towards resilient urban economies and productive urban futures



4.4.1. Economic diversification: a critical pillar for building resilient urban economies

The COVID-19 pandemic is a vivid reminder that overreliance on a single sector, like tourism, increases the fragility of urban economies. Moving forward, cities should consider economic diversification as a core feature of building resilient urban economies (Chapter 10). The need for economic diversification and structural transformation has never been more urgent due to the multiple crises confronting cities. The relatively low levels of economic diversification in developing country cities, particularly in Sub-Saharan Africa, is a key factor in their vulnerability to external shocks.[92] The NUA acknowledges the need to transition progressively to more productivity through high-value-added sectors by promoting diversification, technological innovations and creating quality and productive jobs.[93]

Economic diversification provides different economic outputs, thereby strengthening the ability of cities to drive sustainable growth by creating more jobs, increasing household incomes and attracting investments that strengthens the resilience of urban economies against future shocks.[94] For example, Dubai, United Arab Emirates, has been successful in diversifying its urban economy to reduce dependency on commodity resources aided by expansion in tourism, real estate and trade. This transformation has been supported through expansion in infrastructure, upgrading of financial services sector and establishment of free zones to improve its competitiveness.[95]

In Colombia, the City of Bucaramanga has been effective in diversifying its economy. The city's economy was previously dominated by lower-value-added industries such as clothing, footwear and poultry production. However, it is now home to knowledge-intensive activities such as precision manufacturing, logistics, biomedical research and development labs, and business process outsourcing, as well a vibrant tourism sector.[96] This success was not automatic; it was driven by coalition building and galvanizing local stakeholders towards a shared vision. In addition, Bucaramanga has some of Colombia's highest levels of human capital, including both technical and management skills, which has been a strong driver of its economic diversification agenda. Because of its successful economic diversification, Bucaramanga is doing well in recovering its economy from the COVID-19 pandemic.[97]

Similarly, in Changsha, China, urban leaders successfully transformed the city's economic structure, which was previously dominated by low-value-added, non-tradable services like restaurants and hair salons. The city focused on balancing the growth of existing industries with the attraction and development of emerging automotive and entertainment businesses through sector-specific support strategies such as provision of market intelligence and dedicated worker-training programs. Ultimately, diversification of Changsha's urban economy has reduced its vulnerability to economic shocks and strengthened its local fiscal sustainability.[98]

From the above case studies, it is clear that successful economic diversification cushions urban economies against future volatilities and provides a more stable and progressive path toward inclusive growth. Learning from the pandemic, Windsor, Canada, has adopted a bold and ambitious economic diversification strategy for future growth (Box 4.4).[99] The city government acknowledges that diversification beyond manufacturing is the key to its economic future.

Box 4.4: Windsor's L.I.F.T economic diversification strategy

As a mid-sized city in southwestern Ontario, Windsor is the original home of the Canadian car industry, with a concentration of highly skilled manufacturers. However, successive city administrations have always explored different ways to diversify Windsor's economy. Recently, the city prepared an ambitious economic diversification strategy, which has four pillars: location, infrastructure, future economy and talent (L.I.F.T). Windsor plans to maximize its strategic location, which links it to key US markets. In terms of infrastructure, the plan is to revitalize downtown districts and improve mobility. The city also proposes to develop more diverse housing stock that appeals to young families, with a housing target for downtown that helps drive revitalization.

For the future economy, strategies include protecting Windsor's current strengths in the auto sector and diversifying into adjacent sectors, such as border technology and building expertise in software and cybersecurity for autonomous vehicles. With regard to talent, the city plans to train, retain and attract the best talent from across Canada and the world. An appropriate mix of talent, innovators and entrepreneurs will be critical for driving the city's economic future. The City of Windsor has also devised a mix of investment incentives to attract new investors into the local economy.

Source: City of Windsor, 2020.

Economic diversification should be backed by a menu of support measures such as smart regulations, investment incentives, infrastructure improvements, land provision for new industries, skill development, innovation districts, and access to finance for enterprises.[100] Together, these strategies create competitive cities that can turn around the economic fortunes of urban areas. The future of urban economies in post-industrial cities depends on the implementation of context-specific growth policies. For example, faced with industrial closures and population decline, Katowice, Poland, has embraced technologically driven economic growth and cultural development to diversify its local economy.[101] To achieve urban resurgence in the context of population decline, proactive industrial policies will be urgently needed for "rapid and better-targeted economic restructuring to create a competitive manufacturing sector (endowed with new high-tech firms) and to catalyse growth interdependence with modern local services."[102]

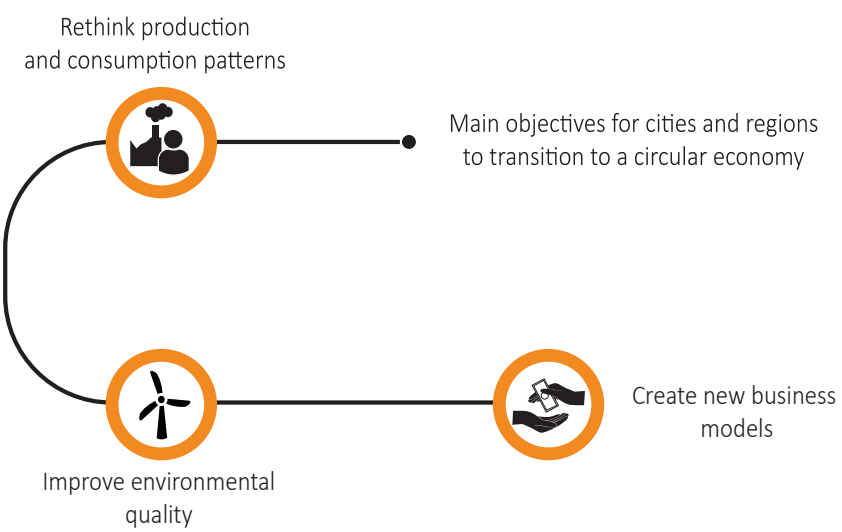
In the same vein, Africa's ambitious development programme Agenda 2063 strongly emphasizes industrialization and structural transformation.[103] In order to achieve this structural transformation agenda, governments will have to put in place appropriate policies to support the diversification of their urban economies. These policies should include supporting the manufacturing sector to create decent jobs and enhance urban productivity while at the same time reducing market barriers to promote the growth of young firms.[104] If successfully implemented, these measures could generate spillover effects with other sectors such as agriculture and services, setting urban economies on a more positive path towards sustainable economic growth (Figure 4.11).

While urban policymakers can learn from some of these successful experiences, there is no "one size fits all" blueprint for economic diversification; government action and policy choices should be contextually calibrated based on existing economic structures and institutional capacities. If urban economies become diversified, they will optimize agglomeration economies, promote innovation and strengthen urban productivity. Recent shocks like the COVID-19 pandemic have shown that failure to heed the call for economic diversification will have serious consequences for the future of urban economies. There are already warning signs in some regions and any further inaction will exacerbate the economic fragility of cities and undermine prospects for productive urban futures.

4.4.2. The circular economy: a new frontier for resilient urban economies

The circular economy presents an opportunity for cities and regions to reimagine and achieve better environmental quality and increased resource efficiency. As discussed in Chapter 5, if cities successfully transition to a circular economy, it could create new jobs, especially for vulnerable communities (Figure 4.12).

Figure 4.12: Main objectives for cities and regions to transition to a circular economy



Source: Adapted from OECD, 2019a, p. 4.

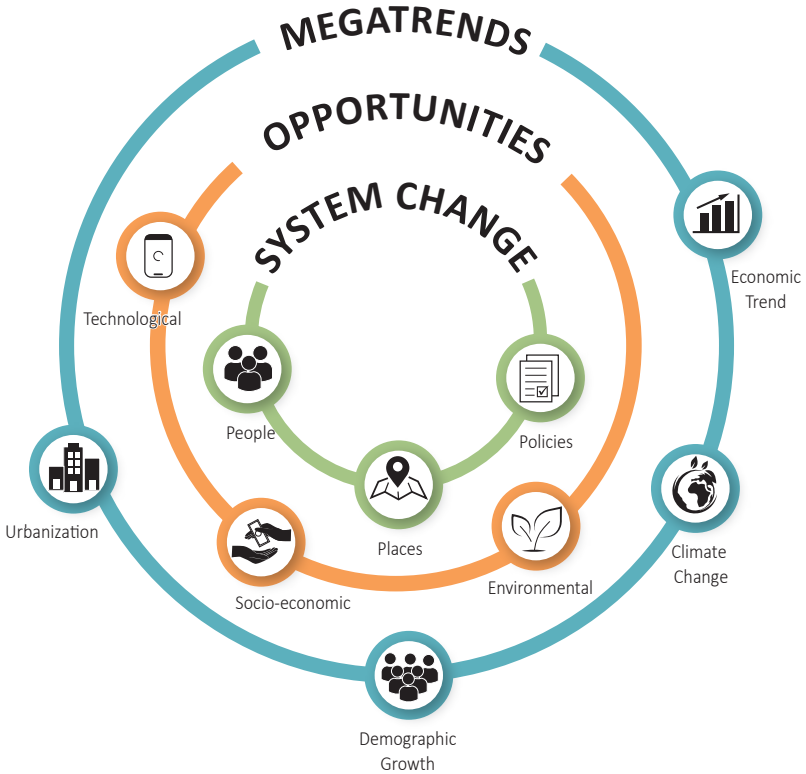
Even before the pandemic, city leaders in Europe were already exploring new ways of enhancing long-term urban prosperity in urban centres.[105] London, Paris, Amsterdam and Milan have been at the forefront of experimenting with the urban circular economy. London was one of the first largest cities in developed countries to implement a circular economy transformation agenda. London's Waste and Recycling Board estimates that the transition to a more effective economy could be worth US$10 billion annually to the city's economy. The city estimates that transitioning to a circular economy could create over 12,000 net new jobs through the reuse, remanufacturing and maintenance industries.[106] The goal in London was to enhance urban economic resilience while promoting resource efficiency as well as adapting the city to new economic realities.

The NUA emphasizes transition to the circular economy in the face of new and emerging challenges confronting urban systems

The NUA emphasizes transition to the circular economy in the face of new and emerging challenges confronting urban systems.[107] Furthermore, in this transformative agenda, Member States committed themselves to developing vibrant, sustainable and inclusive urban economies and promoting "sustainable consumption and production patterns and fostering an enabling environment for businesses and innovation, as well as livelihoods."[108]

Considering these commitments, the circular economy holds great potential for a green recovery and a sustainable urban future. Cities and regions should play a key role as promoters, facilitators, and enablers of circular economy. Adequate conditions should be in place to unlock this potential, which can be achieved through the 3Ps framework of people, places and policies (Figure 4.13). For a transformation to the circular economy to happen, it requires behavioural and cultural change towards different production and consumption pathways as well as new business and governance models in a shared responsibility across levels of government and stakeholders. Successful circular economy policies create complementarities across water, waste, energy, transport,

Figure 4.13: The 3Ps framework for adopting the circular economy in cities



Source: Adapted from OECD, 2019a, p. 7.

housing and land use. Finally, the inflows and outflows of materials, resources and products require a reflection on the appropriate scale at which the circular economy is applied and on functional linkages across the urban-rural continuum.[109]

Transitioning to a circular economy is expected to increase the average disposable income of individuals by reducing costs and prices of products and services. For example, the average disposable income for EU households would rise by €3,000, or 11 per cent more than the current development path, by 2030.[110] This boost would also translate to a 11 per cent GDP increase by 2030. Circular economy practices will likely have a big economic impact, especially in developing countries, by opening opportunities for new decent and productive jobs.[111]

4.4.3. Sustainable urban and territorial planning: a key driver for productive urban futures

Sustainable urban and territorial planning is critical for building resilient urban economies and productive urban futures. Cities that are well-planned and managed better optimize and reap the benefits of agglomeration economies. If cities continue to grow in a disconnected and fragmented manner, the opportunities to leverage economies of scale will be missed. As enshrined in the New Urban Agenda, urban and territorial planning is a fundamental driver for sustained and inclusive economic growth, which provides an enabling framework for new economic opportunities and the timely provision of adequate infrastructure and basic services. For example, if governments continue to underinvest in public transport systems, there will be significant congestion costs, which undermine economic growth and urban productivity.

Going forward, local and regional governments should prioritize the sound and responsive planning and management of urban areas to ensure sustainable urban prosperity. These interventions are in sync with the clarion call of the NUA to "optimize the spatial dimension of the urban form and deliver the positive outcomes of urbanization."[112] Additionally, agglomeration can also occur regionally, making coordination between city authorities for land-use planning critical to promote long-term growth and productive urban futures.[113] If local and regional governments fail to promote better planning and management of urbanization processes, cities could be locked in cycles of massive congestion pressures, which would be detrimental to the productivity and competitiveness of urban economies. This could ultimately tarnish any prospects of resilient urban economies and productive urban futures as promoted in the SDGs and the NUA.

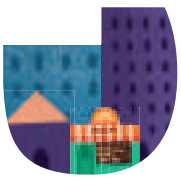
Cities that are well-planned and managed better optimize and reap the benefits of agglomeration economies

Free public park pier at Green Space Located Within Hudson River Park, NYC,USA © MNAphotography/Shutterstock

4.4.4. Recognizing and supporting the informal sector for resilient urban economies

The informal sector is a vibrant economic force in developing country cities, and policymakers at various level of government cannot continue to remain numb to this reality. Therefore, moving forward, a transformative urban economic agenda should focus on reimagining a future urban economy that is more robust, just, ethical and equitable (Chapters 3 and 10).[114] The continued exclusion of informal sector workers is inconsistent with commitments in the NUA (para. 59), where global leaders pledged to recognize the contribution of the poor in the informal economy.

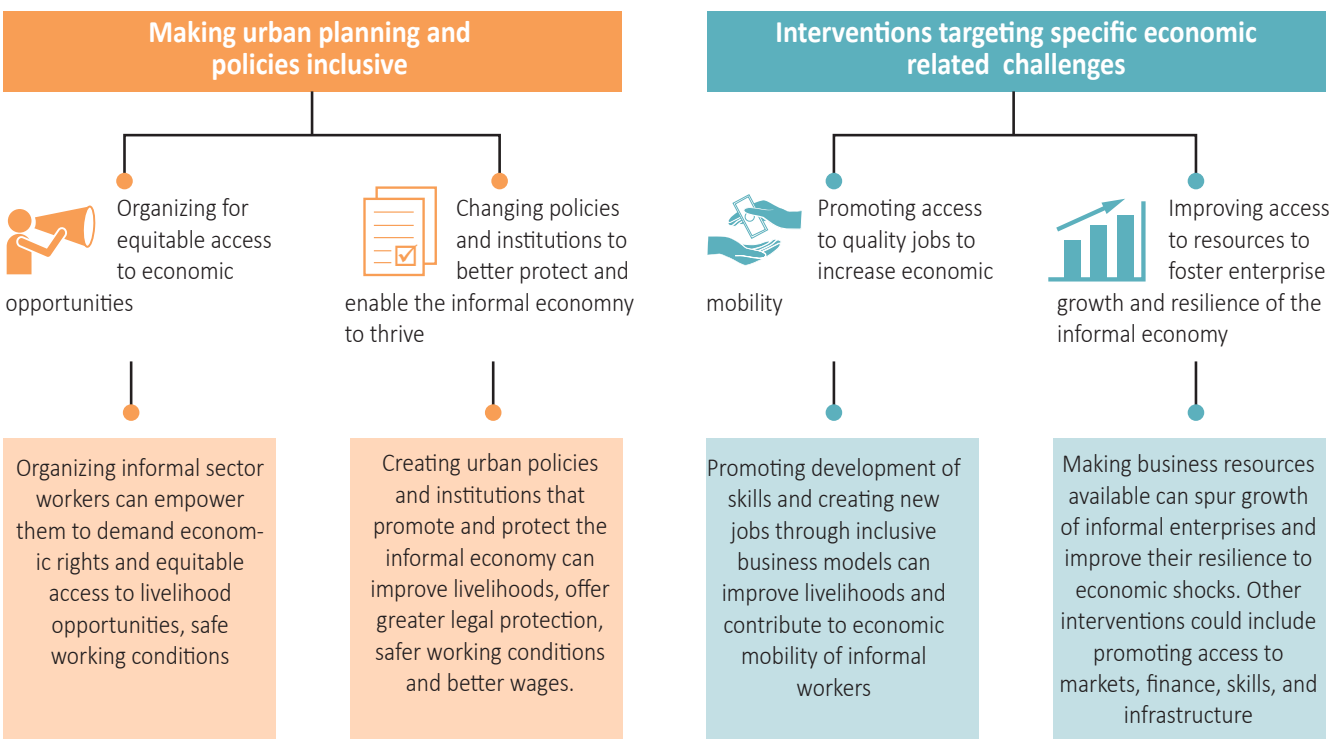
If cities are to leave no one behind, then a paradigm shift is urgently required: urban planning and policy frameworks should be reformed to create more equitable urban futures, where the informal sector is recognized as a legitimate contributor to urban economies and social protection as well as other support measures are extended to workers in the sector (Chapter 3). Such interventions could include creating more legitimate workspaces for informal businesses, facilitating their integration with regional supply chains and regional markets, accounting for informal sector workers in urban economic statistics, and extending relief to individuals and businesses in times of crisis. Resilience building should prioritize formalization policies and measures to strengthen the productivity of informal enterprises through facilitating access to affordable credit and municipal infrastructure improvements that address the underlying vulnerabilities in the informal economy.[115]



Resilience building should prioritize formalization policies and measures to strengthen the productivity of informal enterprises

Figure 4.14 illustrates different interventions that can build the resilience of the informal sector to future shocks. The first two interventions relate to making urban planning and policies inclusive as well as empowering informal economic actors to demand their economic rights such as safe working environments. The last two focus on addressing specific economic challenges confronting the informal economy such as access to markets, finance and business opportunities.

Figure 4.14: Policy interventions to build the resilience of the informal sector



These measures should be tailored to meet the needs of specific groups of informal workers (e.g. street traders, waste pickers and home-based workers) who bear the brunt of economic insecurity. There are emerging practices of informal sector integration. South Africa adopted waste picker integration guidelines in 2020 recognizing that waste pickers have practical experience with adapting quickly to new value chains and market opportunities that can help cities maximize recycling. Similarly, some cities in Colombia, Argentina and India have successfully integrated informal waste pickers into their solid waste management value chains to support door-to-door recycling.[116] This move has unlocked economic productivity and secured livelihoods. In Maputo, waste pickers were registered as cooperatives and integrated into formal collective service, which generated full-time employment for 250 people.[117] Integrating informal workers in urban systems coupled with other support measures can boost the productivity of informal enterprises and strengthen their contribution to resilient urban economies.

The successful integration of informal sector workers into urban policies will contribute towards SDG Target 8.3, which calls for the adoption of development-oriented policies to propel the growth of small and medium-sized enterprises including the informal sector. Failure to support and harness the potential of the informal economy could lead to an unprecedented labour market crisis[118] and curtail the drive toward resilient urban economies and productive urban futures.

4.4.5. Supporting ageing populations in urban areas

The ability of municipalities to meet the challenges of demographic change is important for creating inclusive resilient urban economies and productive urban futures.[119] As highlighted in Chapter 2, developed world cities are likely to have a significant proportion of greying population. Therefore, going forward, cities should formulate tailored policies and programmes to support ageing populations in line with the SDGs, as well as the New Urban Agenda's commitment to address the economic and spatial implications of ageing populations and leverage active ageing for decent

The ability of municipalities to meet the challenges of demographic change is important for creating inclusive resilient urban economies and productive urban futures

An elderly couple in Portsmouth, Hampshire, UK © Shutterstock

jobs and inclusive and sustainable economic growth. Taking action is urgent given that 43.2 per cent of all older populations (65+ years) are in the OECD region,[120] with significant implications for labour supply in the future.

There are emerging practices, where cities are harnessing ageing population to support their urban economies. In Calgary, Canada, the Retired Employee Employment Pool engages retired city employees for limited-term projects that require particular skills or expertise. Other measures include creating opportunities for older workers to remain in the labour force to avoid labour shortages in ageing societies. For instance, Toyama, Japan, implemented agricultural training to increase the employability of older people, as a response to the decline in the number of the city's farm workers.[121] Yokohama, Japan, has taken concerted measures to integrate ageing strategies with its economic development plans and policies for sustainability. The City's emphasis on well-being and economic prosperity has resulted in increased attractiveness and urban competitiveness.

The future of resilient urban economies depends on the ability of cities to develop policies that create new jobs and harness the experiences of older populations while at the same time implementing strategic actions aimed at retaining young and skilled persons while reducing their outflow

from cities. Cities grappling with an ageing population could also strategically incorporate newly arriving migrants into local labour markets to counter negative population growth, ensuring sustained future economic growth that, in turn, is required to finance local infrastructure services.[122] Together, these measures will promote resilient, inclusive and sustainable urban economic growth.

4.4.6. Targeted interventions for socially and economically marginalized groups

The COVID-19 pandemic has aggravated the vulnerabilities of specific groups such as minorities, migrants, indigenous peoples, women and people with disabilities. The pandemic has demonstrated the urgency of effective and robust social protection programs for urban economic resilience and recovery.[123] Gazing into the future, developing a range of tailored economic support and relief packages to informal workers, vulnerable urban populations and at-risk sectors is vital for building resilient urban economies. Bangladesh's 2020 Urban Social Protection Strategy and Action Plan sets out plans for expanding social protection to urban areas, including the design of a conditional cash transfer programme for the urban poor, especially those living in slums.[124]

Cities and subnational governments can also create tailored strategies that respond to different forms of vulnerability as well as unexpected shocks. These measures should be nuanced and wide-ranging to ensure that the different risks associated with gender, age, disability, ethnicity, migratory status and other characteristics are effectively identified and addressed in urban welfare programmes.[125] Social protection strengthens households' ability to invest and take productive risks, which boosts livelihoods and increases economic resilience.[126] Thus, urban-sensitive social protection could potentially be a powerful tool for promoting inclusive urban economies (Chapters 1 and 3).

4.4.7. Balanced urban and territorial economic development

The NUA encourages governments to promote balanced territorial development to reduce disparities within the urban system. Secondary cities connect 62 per cent of the world's population living in smaller cities, towns, and rural areas, and the 22 per cent that live in metropolitan regions.[127] Going forward, it is important for governments to prioritize balanced economic development, especially in 'left behind' secondary cities, while addressing territorial disparities in infrastructure and basic services. These intermediary cities are hubs for provision of goods and services to the hinterland and are instrumental in structuring urban-rural linkages, thus providing a conducive environment for job creation and income diversification. With effective management these cities can provide greater investment and business opportunities and facilitate transformation across the urban-rural continuum.[128]

Noteworthy, in 2021, under the Italian Presidency, the G20 recognized the significant, but often unexplored and underutilized potential of intermediary cities in achieving the SDGs at the local level. In this regard, the G20 Platform on SDG Localisation and Intermediary Cities (G20 PLIC) was established to facilitate the exchange of good practices that strengthen intermediary cities and rural-urban linkages in developing countries.[129] Additionally, to advance balanced territorial development that also strengthens the socioeconomic status of these cities, UN-Habitat has been supporting the implementation of national urban policies (NUPs) in 56 Member States.[130] In advocating for balanced territorial development—as aimed for in SDG Target 11.a—these urban policies are a priority and a driver of sustainable national development.

Today, various countries are scaling up efforts to support their intermediate cities. For example, through the Secondary Cities Support Program, Ghana deployed World Bank loans to its municipal assemblies in order to promote economic development of intermediate cities.[131] This programme acknowledges the need to address disparities in Ghana's urban system, where economic growth and employment opportunities are concentrated in Greater Accra and the Kumasi regions at the expense of intermediate cities.[132] Finland, Laos and Turkey supported smaller population centres through regional development programmes. Investing in secondary cities could enhance their productivity and ignite their potential to add value to metropolitan economies.

4.4.8. Sustainable and innovative municipal finance for resilient urban futures

Sustainable and innovative municipal finance is a catalyst for urban economic resilience and productive urban futures. Cities must diversify their revenue streams by mobilizing innovative revenue sources. The COVID-19 pandemic has shown that overreliance on traditional revenue sources like central government transfer could have potentially crippling effects on the fiscal health of cities. Thus, the need for structural policies to bolster growth and enhance local revenue as well as measures that mitigate vulnerability to shocks.[133] It is important to address how urban futures can be adequately financed in the face of dwindling local government revenues, increasing national budget deficits

and decreasing foreign investment in certain contexts, among other fiscal constraints.

Importantly, cities will be on a path to resilience when the objectives and programmes undertaken by such financing are aligned with sustainability ambitions. The Local Government Association in the UK, for instance, proposed the Sustainable Urban Futures Fund, which is potentially a game changer in terms of building back better. This fund is expected to provide long-term, large-scale funding for integrated urban recovery programmes to improve economic vitality of cities. The financial resources could be used to tackle priority infrastructure needs (Figure 4.15). This fund could be applied to implement place-based integrated programmes to promote sustainable economic growth and recovery after the COVID-19 pandemic, thereby strengthening the resilience of urban economies.

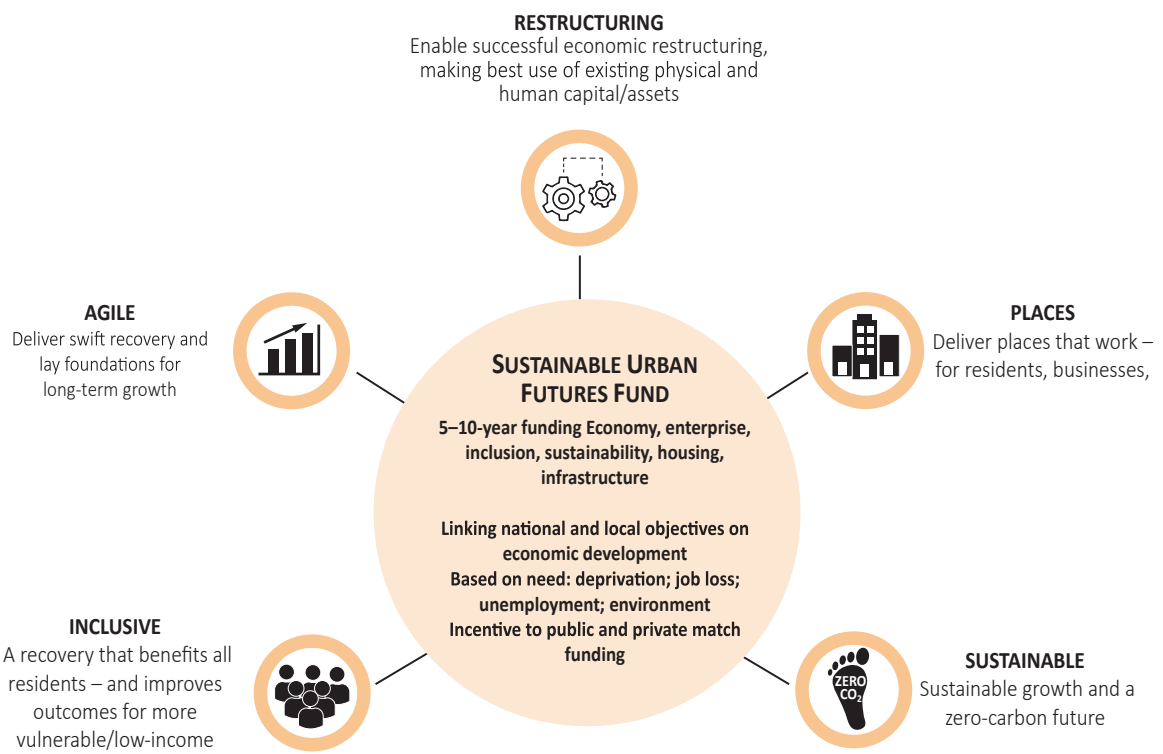
However, context matters. Such innovative funding instruments could be tailored to other jurisdictions considering existing social, economic and political climates. It would require massive domestic resource mobilization and strong intergovernmental collaborations and political will.[134]

If implemented, this could result in significant economies of scope and scale, achieving much higher impacts, gaining more private sector leverage and buy-in than small individual grant schemes.[135]

In Sub-Saharan Africa, there are emerging innovations in municipal revenue mobilization to address gaps in infrastructure investments. For instance, Mzuzu, Malawi, an intermediate city that historically lacked adequate central government transfers, implemented a revenue mobilization programme, which deployed a fit-for-capacity property valuation system that resulted in a seven-fold increase in revenues.[136] Municipal government in Teresina, Brazil, has implemented a reprioritization of existing municipal budgets in order to increase the availability of finance through restructuring own-source revenue arrangements to mobilize additional resources through new sources or expanding some of the existing ones.[137]

The other innovative financing instrument which cities could leverage on is land value capture. This has been successfully implemented in cities like Hargeisa, Somaliland (Box 4.5) and Bogotá, Colombia, with significant economic gains. In

Figure 4.15: Pillars of the Sustainable Urban Futures Fund



Source: Adapted from Local Government Association, 2021.

Box 4.5: Innovative municipal finance mobilization using land value capture in Hargeisa, Somaliland

To capture the gains of rapid urbanization, Hargeisa city government has implemented a system of "in-kind" land value capture or exaction. With this system, landowners on the outskirts of the city who apply to convert their land from rural to urban land use must provide the city government with 30 per cent of the asset if their application is approved. In this way, the city can access land for needed public infrastructure to service a growing city. At the same time, rent from this land can offer the city a valuable source of additional income to pay for the required infrastructure. The Hargeisa case study also shows that planning for future expansion is not only useful for capturing the gains from rapid urbanization through exaction, but also improves future urban investment.

Source: UN-Habitat et al, 2021.

Bogotá, a betterment levy (contribución de valorización) charges property owners a fee to defray the costs of public works improvements. Between 1997 and 2007, this innovative financing mechanism has been used to fund over US$1 billion worth of investment in 217 infrastructure projects all over the city.[138]

The successful implementation of innovative financing instruments should be accompanied by capacity building for municipal officials, administrative and policy reforms, technical innovation and strengthened political incentives. Municipal governments should be granted better fiscal autonomy for cities to modify their tax structures in line with their existing economic bases. This will enable cities to collect a better mix of sales, income and property taxes and become better prepared to face changes in economic conditions and residents' needs. This flexibility will also provide local governments with opportunities to diversify their revenue portfolios, which is key for strengthening urban economic resilience against future shocks. As cities focus on rebuilding their urban economies, they should confront the challenge of the 4Rs of urban finance for recovery (Figure 4.16).

The ability of municipalities to meet the challenges of demographic change is important for creating inclusive resilient urban economies and productive urban futures

Cities should also leverage public-private partnerships (PPPs) to develop ambitious infrastructure programmes. Japan is implementing capital intensive innovations in partnership with the private sector. Such initiatives include the Shibuya Station regeneration and Tokyo Station, whose objective is to overhaul ageing transport infrastructures and create a vibrant urban economy. Japan's central government policies no longer rely on stimulating growth through public capital investment, but rather seeks private sector support for innovation districts and zones in second-tier cities with negotiated regulatory incentives.[139] Chicago, US, has been successful in developing and mobilizing new PPP models and value capture innovations, often in partnership with major banks, transnational infrastructure developers and other private-sector financial partners.[140] These financing models are becoming popular because of dwindling federal funding for urban programmes.

Figure 4.16: 4Rs of urban finance for economic resilience

Source: UN-Habitat and UNCDF, 2021.

For a resilient future, an enabling environment is critical for mobilizing sustainable and innovative financing mechanisms (Figure 4.17). Cities can also explore the possibility of using green bonds to fund interventions such as the transition to circular economies (Chapter 10). Gothenburg, Sweden, was the first local authority to launch a municipal green bond in 2013 and has since developed a robust framework for such instruments.[141] For this financial scheme to be replicated in most regions, local governments require fiscal autonomy, legal power and creditworthiness. An effective local tax base is also necessary to allow cities to tap global finance more successfully and thus build up the city's creditworthiness.

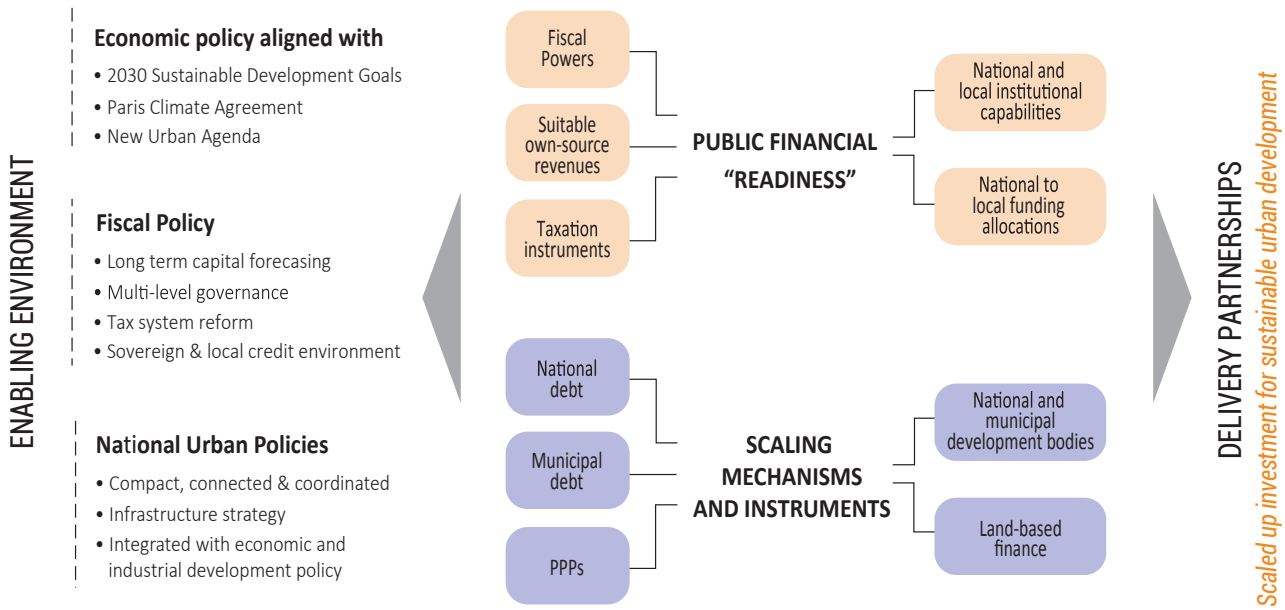
In most places, reforming tax systems is much needed to strengthen cities' fiscal sustainability. Cities like Freetown, Sierra Leone, for example, are reforming their property tax system to enhance revenue generation for infrastructure development (Box 4.6).[142] In the near and long-term, building this capacity can yield significant returns, such as tapping into the ever-growing green bond market which saw US$52 billion worth of bond issuances in 2019, a 21 per cent increase from 2018.[143]

Box 4.6: Freetown is reforming its property tax system

Freetown has recognized that to fund public services, it needs to raise property taxes. In 2020, after a two-year-long working group, the city reformed its property tax system, which will use a simple model to calculate property values and a new IT system to manage the entire tax collection process. The city has also registered almost all the 100,000-plus properties in the city. The system will make the property tax regime of Freetown more progressive and has resulted in much higher tax bills for the most valuable properties. The tax payable on the top 20 per cent of properties has more than tripled, on average. At the same time, that on the bottom 20 per cent has been more than halved. Under the system, Freetown's potential revenue from property tax is estimated to increase more than five-fold.

Source: Kamara et al, 2020.

Figure 4.17: Creating an enabling environment for scaling-up investment



Source: Adapted from Ahmad et al, 2019.

Overall, the realization of resilient urban economies and productive urban futures depends on the capacity of cities and subnational governments to mobilize adequate financial resources to fund infrastructure investments. While the need for new infrastructure investments in undeniable and urgent, the current unmet needs have negative repercussions on urban economies. Underinvestment in key infrastructure threatens competitiveness and the productivity of cities, thereby casting a shadow on urban economic resilience. If cities fail to close the massive gaps in infrastructure financing and investment, they will struggle to attract domestic and foreign investment—thereby putting the future of their economies in jeopardy.

4.4.9. Prioritizing infrastructure investments for productive urban futures

Cities and subnational governments must urgently prioritize infrastructure investments towards building resilient urban economies and prosperous urban futures. Slums and informal settlements in developing country cities are underserved with key municipal infrastructure (Chapter 3), which undermines the productivity of residents and make cities unattractive for investment. Within cities, investments in road infrastructure provide significant economic returns. For Kampala, investment of around US$82 million in road infrastructure provided a net economic benefit of US$15 to US$35 million per year.[144] Overall, closing Africa's infrastructure gap could result in 1.7 per cent increase in annual GDP growth, with large economic gains in cities.[145]

Estimates reveal that a dollar invested in developing water and sanitation infrastructure generates between US$4 and US$34 in benefits by improving health outcomes, saving time and boosting urban productivity.[146] Additionally, investing in transport infrastructure also improves connectivity that allows people and goods to move easily within and between cities. Moreover, investments in public transport systems typically trigger economic benefits, especially for the urban poor whose access to jobs is affected by socio-spatial segregation. Investment in mass transit systems are also a catalyst or resilient and inclusive urban futures (Chapter 5). Bogotá's bus rapid transit system increased the average welfare of the city's residents by 3.5 per cent.[147] Another important priority is investing in green energy infrastructure, which has strong potential to unleash productive growth throughout the entire urban economy, thus creating employment, generating revenue and yielding spin-off effects to multiple sectors.

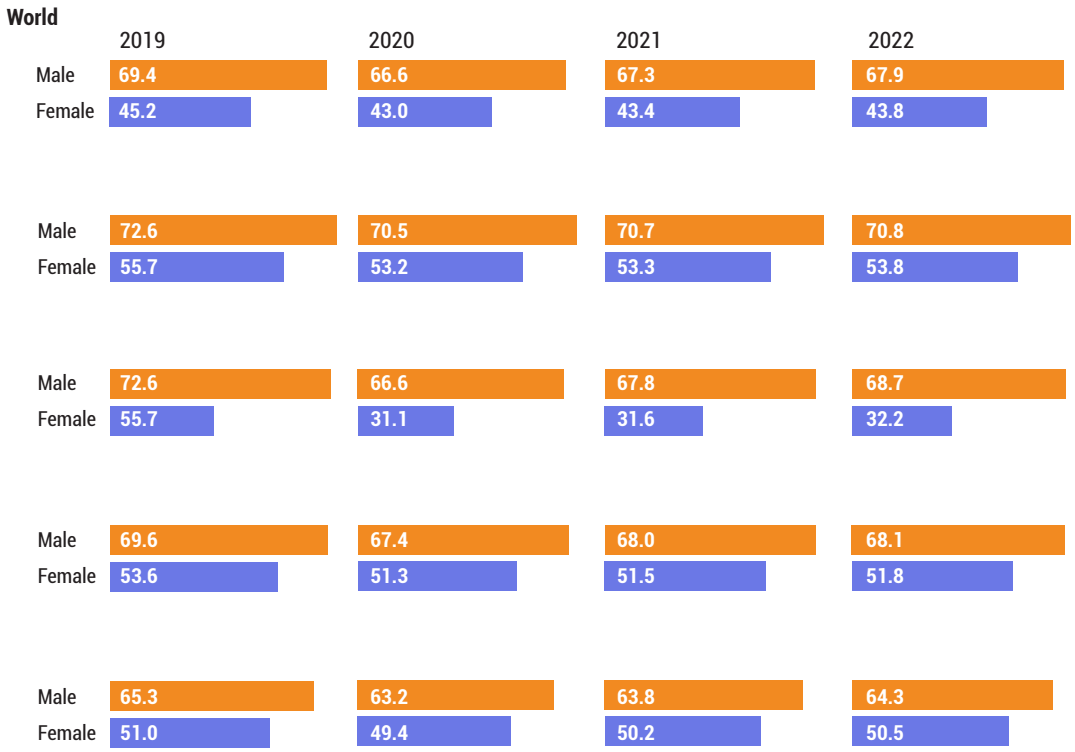
COVID-19 has amplified the need for investing in digital infrastructures[148] to meet the needs of the new economy, including an expansion of digital networks (Chapter 9). Digital infrastructures are critical for cities to transition to greener and inclusive urban economies. Therefore, the future of resilient urban economies depends on governments' commitment to invest in key infrastructure and public services. Such investments could steer cities away from the pessimistic scenario of urban futures (Chapter 1) and galvanize action towards building inclusive, thriving, resilient and productive urban futures in sync with the SDGs and the NUA. Making these transformations not only enhances equitable access to urban services for the poor, it can also yield large dividends and cascading benefits for the entire urban economy, as highlighted above. On the other hand, failure to address underinvestment in infrastructure will undermine urban competitiveness and threaten the productivity of cities, as well as constrain national economies, particularly in developing countries.

4.4.10. Talent and skills development for resilient urban economies

In recent years, there has been significant transformation in the world of work. These winds of change are guaranteed to persist into the future. The COVID-19 pandemic, for instance, has ushered in a new economic order that is based on innovation and technology (Chapter 9). It is imperative that cities and subnational governments continually invest in human capacity development to reskill and upskill workers in order to keep pace with these transformations so as to meet the requirements of the new urban economy.[149] Developing skills and talent for human capital is vital for inclusive and sustainable urban growth as it aligns with SDG 8 on promoting productive employment and decent work for all. Failure to reintegrate workers separated from labour markets during the pandemic through reskilling or upskilling puts the future of urban economies at further risk.

Policy action is particularly important for women, youth, migrants and refugees, among other vulnerable groups who are more likely to have dropped out of labour force.[150] The COVID-19 crisis had a disproportionate impact on women and youth employment.[151] Women, for instance, comprised a large share of the workforce in the sectors worst affected by the pandemic and the drop in their employment-to-population ratio has been relatively higher than that of men. It is projected to remain so in the coming years (Figure 4.18).[152]

Figure 4.18: Employment-to-population ratio by sex, 2019–2022



Source: ILO, 2022.

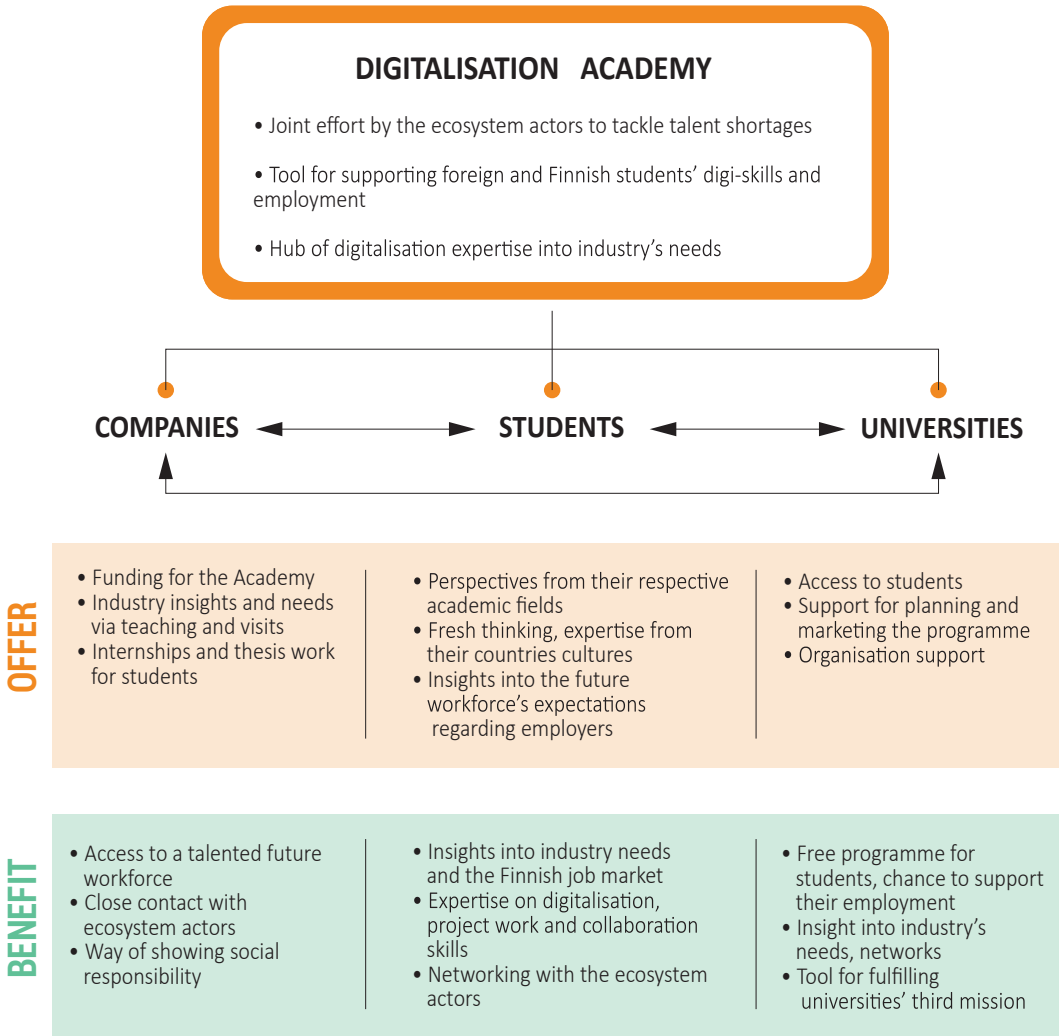
Another way to advance talent and skills development to achieve resilient urban economies is by cultivating research, training and innovation through the establishment or expansion of urban research universities. Research-intensive universities can act as a magnet for talented students and researchers, drive innovation and provide opportunities for the local population to gain new skills and increase their earnings; thereby boosting the urban economy.

In the US counties, for example, a US$1 increase in university expenditures leads to an 89-cent increase in the urban income.[153] In China, Suzhou Industrial Park has set up its own technical and vocational training college. This has resulted in stronger linkages between skills supply and actual needs of the local industries as well as boosting productivity and competitiveness of the industrial park.[154] These measures were complemented with talent attraction strategies such as housing subsidies. To retain talent, the city of Vaasa, Finland, implemented the Digitalisation Academy in 2018 in partnership with a local university[155] (Figure 4.19). This academy was designed to respond to the talent shortage in the region's business sector by strengthening the digital skills of Finnish and foreign students studying in Vaasa and supporting their employment in the region's companies.

Vaasa's Digitalisation Academy demonstrates the importance of partnerships between universities, firms and regional authorities in implementing talent development programs. Skills development and talent retention programs are critical in cities that are experiencing urban shrinkage. As people become skilled and reskilled, this talent pool can attract high-tech industries, stimulate local innovation networks that enable better realization of agglomeration advantages and contribute to urban productivity. These training opportunities should also be extended to informal sector workers to boost their productivity and alleviate long-term vulnerability.

training opportunities should also be extended to informal sector workers to boost their productivity and alleviate long-term vulnerability

Figure 4.19: The Digitalisation Academy model in the city of Vaasa, Finland



Source: Adapted from Niemi et al, 2021.

Investing in stronger human capital is a response to the NUA's commitment on "providing the labour force with access to knowledge, skills and educational facilities that contribute to an innovative and competitive urban economy."[156] Cities with a large pool of skilled human capital are more resilient to future economic turbulence compared with those that do not. At the same time, it is vital to incentivize a human-centred work culture and work models for firms. In developed countries, the pandemic has spurred what is referred to as the Great Resignation or Great Reshuffle that has been largely characterized by a higher attrition as workers change jobs, "hoping for something more—more purpose, more flexibility, more empathy."[157]

4.4.11. Peaceful and stable societies

The transformative pathways towards resilient urban economies and productive urban futures discussed in this section can only be effectively pursued and result in meaningful outcomes in peaceful and stable societies. Social stability and peace are critical ingredients for fostering urban economic resilience. Besides structural conditions, the future economic outlook of cities and nations hinges on their prevailing social conditions as well as the relationship between nations. The past decades have shown that peace and security challenges in one country have the potential to easily spill over and bear negative impacts regionally and even globally.

Today, urban areas are increasingly becoming platforms of local and international armed conflicts: "wars have moved into the lives, cities and homes of ordinary people in a more vicious way than ever before."[158] As alluded to in previous sections, conflict destroys local economies. Conflicts and societal instability result in displacement, loss of life, economic disruption, lower consumption and destruction of urban assets. In regard to the ongoing conflict in Ukraine, for example, preliminary estimates put the overall cost of rehabilitating the country after the war at €200–500 billion (US$220–540 billion)—the upper limit is over three times Ukraine's pre-war GDP.[159] These disruptive events also inhibit revenue mobilization capacity, leading to lower local and national revenue flows, among other negative impacts that cultivate the pessimistic scenario alluded to in Chapter 1.

The 2030 Agenda for Sustainable Development is our common global blueprint to create more peaceful, stable and resilient societies.[160] Fully respecting human rights, embracing the presence of strong and effective institutions at all levels as envisaged in SDG 16, and establishing values and norms that facilitate the resolution of problems in peaceful and non-violent means are key to a prosperous future. At the same time, to secure a sustainable urban future, global priority must be given to the fostering of international cooperation and the practice of preventive diplomacy, overcoming conflicts through agreements and compacts, as well as addressing the dynamics that give rise to and reinforce conflicts and social instability. Lastly, the pursuit of sustainable urbanization must be an imperative; it is an enabler of peace and stability.[161]

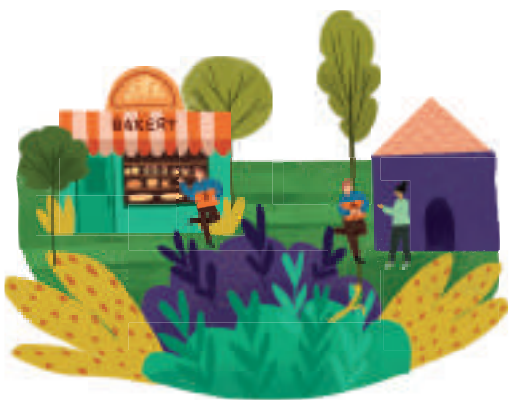
4.5. Concluding Remarks and Lessons for Policy

Although the COVID-19 pandemic has unleashed an unprecedented crisis, it also provides an opportunity for directing investment towards building resilient urban economies and productive urban futures. Globally, cities have differential economic fragility. Some cities are more resilient to shocks while others are more vulnerable because of differences in economic structures and fiscal health, among other factors. For the collective visions of sustainable, resilient and productive urban economies to be realized as enshrined in the SDGs and the New Urban Agenda, this chapter has placed emphasis on the following key policy areas for cities and subnational governments to drive inclusive economic growth:

- Prioritize investment in key infrastructure and services to strengthen urban competitiveness and boost productivity of cities towards sustainable, resilient and inclusive economic growth.
- Mobilize sustainable and innovative financial resources such as PPPs and land value capture to complement traditional sources of revenue.
- Recognize and integrate the informal sector into urban systems as well as facilitate access to markets, finance and training to enhance the productivity of informal enterprises and strengthen their resilience to future shocks.
- Implement targeted interventions to expand the capabilities of marginalized groups, including tailored social protection measures to alleviate their vulnerability to future shocks.
- Support ageing populations and harness active ageing for new decent jobs and inclusive economic growth in line with SDGs and the NUA.
- Strengthen sustainable urban and territorial planning to reduce costs associated with congestion pressures and diseconomies of scale.
- Diversify urban economies and revitalize post-industrial cities as a critical part of achieving broader economic resilience, especially in contexts where there is overdependence on single industrial bases.
- Invest in skills and talent development to enhance access to decent and productive employment for all, including reskilling to meet the demands of the new urban economy.
- Adopt the circular economy as a catalyst to greater urban economic resilience while promoting resource efficiency as well as adapting cities to new economic realities.
- Implement balanced territorial economic development to reduce regional disparities and promote equitable and inclusive economic growth.
- Cultivating peaceful and socially stable societies.

Endnotes

1. Henderson and Kriticos, 2018.
2. United Nations, 2017.
3. United Nations, 2017.
4. Cohen and Simet, 2018; UN-Habitat, 2011a.
5. City of Melbourne, 2020.
6. Hoogeveen and Lopez-Acevedo, 2021.
7. UNECE, 2021.
8. Local Government Association, 2021.
9. OECD, 2020c.
10. Wahba et al, 2020.
11. UNECE, 2021; Adrian and Gopinath, 2021.
12. United Nations, 2022a.
13. United Nations, 2022b; United Nations, 2022c; Tollefson, 2022; Pomeroy, 2022; Anayi et al, 2022.
14. United Nations, 2021.
15. UN-Habitat and UNCDF, 2021.
16. Ženka et al, 2019.
17. Zhiwei et al, 2019.
18. UN-Habitat, 2020a.
19. UN-Habitat, 2020a.
20. Abreha et al, 2021.
21. World Bank, 2020f.
22. Lall and Maloney, 2022.
23. Page et al, 2020.
24. Grover et al, 2022.
25. Page et al, 2020.
26. Lall et al, 2017.
27. UN-Habitat, 2020a.
28. Lall et al, 2017.
29. Venables, 2015.
30. United Nations, 2021.
31. Hoogeveen and Lopez-Acevedo, 2021.
32. Hoogeveen and Lopez-Acevedo, 2021.
33. ILO, 2018.
34. Ohnsorge and Yu, 2021.
35. ILO, 2018.
36. Godfrey et al, 2016.
37. Chen and Beard, 2018.
38. IMF, 2017.
39. Grover et al, 2022; Henderson and Nigmatulina, 2016.
40. Henderson and Nigmatulina, 2016.
41. Sachs et al, 2021.
42. Peralta-Quirós, 2015.
43. Avner and Lall, 2016.
44. Ellis and Roberts, 2016.
45. UN-Habitat, 2020a.
46. Glaeser and Xiong, 2017.
47. United Nations, 2022d.
48. UN-Habitat and UNIDO, 2021.
49. UN-Habitat et al, 2021b.
50. Cities Alliance, 2021.
51. Government of the Democratic Social Republic of Sri Lanka, 2018.
52. Thieme, 2016.
53. United Nations, 2017.
54. Cities Alliance, 2021b.
55. Knuth and Krishnan, 2021.
56. Löffler, 2016.
57. OECD and UCLG, 2019.
58. OECD and UCLG, 2019.
59. UN-Habitat and ESCAP, 2019.
60. Ellis and Roberts, 2016.
61. Venkateswaran, 2014.
62. Ahmad et al, 2019.
63. World Bank, n.d.
64. UN-Habitat, 2020c.
65. Bernal et al, 2020.
66. United Nations, 2022d.
67. UN-Habitat et al, 2021.
68. UN-Habitat, 2020a.
69. Angel and Blei, 2016.
70. Cleave et al, 2019.
71. Beer et al, 2020.
72. Fratesi and Rodríguez-Pose, 2016; Capello et al, 2015.
73. European Union, 2021.
74. European Union, 2021.
75. Morill, 2014.
76. Biswas et al, 2018.
77. Kilroy et al, 2015.
78. Kilroy et al, 2015; Jarzebski et al, 2021.
79. Martinez-Fernandez et al, 2016.
80. Ahmad et al, 2019.
81. Municipal Securities Rulemaking Board, 2022.
82. Woetzel et al, 2017.
83. Woetzel et al, 2017 ; UN-Habitat 2020a.
84. UN-Habitat, 2016a.
85. Guo and Chen, 2021.
86. National League of Cities, 2020.
87. Schulze and King, 2021.
88. City of Melbourne, 2021.
89. Pagano and McFarland, 2020.
90. UNECE, 2019.
91. ICLEI et al, 2018.
92. Ndung'u, 2020.
93. United Nations, 2017.
94. UN-Habitat and DiMSUR, 2020.
95. Deloitte, 2014.
96. Kulenovic, 2015.
97. Ijjasz-Vasquez and Mukim, 2021.
98. Kulenovic and Zhu, 2016.
99. City of Windsor, 2020.
100. Ijjasz-Vasquez and Mukim, 2021.
101. Urban Transitions Alliance, n.d.
102. Bartholomae et al, 2017.
103. César, 2021.
104. César, 2021.
105. Bonato and Orsini, 2018.
106. Bonato and Orsini, 2018.
107. NUA para. 71 (United Nations, 2017).
108. NUA para. 45 (United Nations, 2017).
109. OECD, 2019a.
110. Ellen MacArthur Foundation, 2015.
111. Deloitte, 2020.
112. United Nations, 2017.
113. Ellis and Roberts, 2016.
114. UN-Habitat, 2021a.
115. OECD and ILO, 2019.
116. Mahendra et al, 2021.
117. Buque and Ribeiro, 2015.
118. ILO, 2020a.
119. OECD, 2015a.
120. OECD, 2015a.
121. OECD, 2015a.
122. Cohen and Simet, 2018.
123. UN-Habitat and UNCDF, 2021.
124. Government of People's Republic of Bangladesh, 2020.
125. UN-Habitat, 2021a.
126. RNSF, 2017.
127. Cities Alliance, 2021.
128. Suri and Bonaglia, 2021.
129. OECD, 2021a.
130. See National Urban Policy Platform (https://urbanpolicyplatform.org).
131. See Ghana Secondary Cities Support Program (https://projects.worldbank.org/en/projects-operations/project-detail/P164451).
132. World Bank, 2018b.
133. World Bank, 2022b.
134. Bandauko, et al. 2021.
135. Local Government Association, 2021.
136. UN-Habitat et al, 2021.
137. UN-Habitat and UNCDF, 2021.
138. Mahendra et al, 2021.
139. UN-Habitat and ESCAP, 2019.
140. Knuth and Krishnan, 2021.
141. City of Gothenburg, 2019.
142. Kamara et al, 2020.
143. Amundi Asset Management and International Finance Corporation, 2020.
144. CDC Evidence Review, 2021.
145. CDC Evidence Review, 2021.
146. World Water Assessment Programme, 2016.
147. Tsivanidis, 2018.
148. World Economic Forum, 2020.
149. Neagle, 2022.
150. World Bank, 2022b.
151. Young people (15–24 years) fared worse than persons above 25 years old during the crisis (ILO, 2022).
152. ILO, 2022.
153. Kantor and Whalley, 2014.
154. Zeng, 2016.
155. Niemi et al, 2021.
156. United Nations, 2017.
157. Linkedin, 2022; ILO, 2021.
158. ICRC, 2017.
159. The Economist, 2022.
160. Harris, 2018.
161. UN-Habitat, 2021b.



Chapter 5:

Securing a Greener Urban Future

Quick facts

1. Current net zero policies have pitfalls, including an overreliance on underdeveloped technologies that overlook local resources and the lack of integration of local governance strategies in national programmes for action.

2. Climate impacts and other environmental crises interact with drivers of urban inequality, which threatens the futures of cities.

3. Greener futures cannot be secured without just transitions.

4. The world is losing the opportunity to use the post-pandemic context as a catalytic moment to facilitate investment for a transition to net zero carbon emissions.

Policy points

1. Achieving net zero is also dependent on subnational and city-level action. Policymakers at all levels must therefore recognize and support the role of urban areas in the net zero transition.

2. Nature-based solutions must be part of inclusive planning processes for sustainable urban futures—local action to secure greener futures cannot overlook their vital role.

3. In environmental decision-making, diverse voices and perspectives must be heard to minimize uncertainties in the pathways to securing greener urban futures.

4. Various levels of government and institutions should harness the potential of international partnerships such as transnational networks and social movements in delivering greener urban futures.

We are living a unique moment, where the world is transcending a pandemic whose recovery efforts are entangled with a push to develop alternative futures. The climate crisis—and related goals of keeping the global average temperature change under 1.5 degrees—and avoiding mass extinction now a primary concern at various levels of governance. Cities continue to be at the forefront of environmental and sustainability action, although after a decade of optimism, their role in constructing sustainable urban futures is increasingly questioned by the public, especially younger generations operating with a sense of urgency out of fear for their future. In short, the promise of sustainable urbanization remains unfulfilled.

Calls for urgent action on the climate and biodiversity crises emphasize the need to build sustainable urban futures. The challenge for various actors is to envision how those futures can make urban space liveable for humans while not contributing to environmental degradation. But multiple uncertainties shape environmental action. While living in the Anthropocene, we must recognize the impact humans have on the Earth as a whole, with implications for human societies and ecosystems.[1] Previous editions of the UN-Habitat World Cities Report have argued that there are opportunities to harness the value of sustainable urbanization to advance green, resilient and more equitable futures.

The goal of limiting average mean temperature rise to 1.5°C by 2100 has become a policymakers' guiding metric to imagine sustainable futures

The goal of limiting average mean temperature rise to 1.5°C by 2100 has become a policymakers' guiding metric to imagine sustainable futures. In 2018, the IPCC Special Report identified two pathways to maintain this goal. The first pathway is to stabilize global warming at or below 1.5°C above pre-industrial levels. The second pathway, also called an "overshoot" pathway, foresees global warming exceeding 1.5°C around mid-century, remaining above 1.5°C for a maximum duration of a few decades, and returning to below 1.5°C before 2100.[2] Both pathways highlight mitigation and adaptation efforts in multiple sectors, including energy, transportation, forestry and sustainable land use.

Despite securing net zero commitments from 153 countries, the Glasgow Climate Pact negotiated at COP26 in November 2021 showed that current steps to limit global warming are insufficient. The lack of ambition in current national commitments echoes a lack of imagination in defining alternative urban futures. Much of the debate has rightly focused on keeping the 1.5°C goal alive, with subnational governments making new commitments that accelerate climate targets to 2030.[3] At the same time, the great extinction likely to sweep away the world's biodiversity speaks to the disconnection of human activity from its natural surroundings.[4] There is one last chance for humanity to reconcile with the possibilities of living on Earth, shift development pathways, and reconnect with the stewardship role that recognizes a mutual and beneficial relationship between humans and the environment. Every citizen has a role to play in actively engaging with the urban landscape.

This chapter analyses the interrelated challenges of climate change and biodiversity to explore how alternative urban futures could be developed. The rationale of the chapter follows an examination of the ideas about the future that dominate planning practice. In particular, the chapter engages with two alternative future-oriented approaches. On the one hand, the chapter examines the growth of scenario planning and scenario modelling to consider what the future means for urban areas. On the other hand, following the operation of scenarios in practice, the chapter recognizes the need to include multiple perspectives and acknowledge inequality in planning practices. These two cross-cutting themes are examined in six sections that explore different aspects of delivering green urban environments: the transition towards net zero carbon, the future of urban transport, the increasing importance of building resilience, the growing visibility of nature-based solutions, the development of inclusive urban planning, and the constitution of global partnerships to deliver green urban futures. Each section thus explores the treatment of futures, how future visions influence planning practice as well as their impact on populations across the urban-rural continuum.

5.1. Urban Transitions to Net Zero GHG Emissions

Net zero GHG emissions means achieving balance, over a specified period, between anthropogenic GHG emissions produced by human activities and those removed from the atmosphere through reduction measures.[5] The transition to net zero emissions requires sustainable consumption and production practices that facilitate responsible resource use and address climate change's adverse impacts. However, the conceptualization of net zero carbon varies across scales and

sectors. For example, territorial approaches, which calculate emissions within national borders, are widely used at the national scale for carbon accounting.

By contrast, the conceptualization of net zero emissions at the city level faces two practical challenges. First, inventory data at the city level is often unavailable. Second, cities present specific complexities due to their "smaller spatial scale and embeddedness within larger-scale social, ecological and infrastructural systems."[6] For instance, urban energy and economic systems depend on long-distance exchanges. Accounting for these transboundary carbon flows is challenging when considering the city as an analytical unit for carbon measurements.[7] A net zero carbon city can be imagined quite differently depending on the focus of carbon accounting approaches—whether net zero territorial emissions, net zero community-wide physical provisioning systems, net zero household expenditures, or net zero trade.[8]

Recent research warns against undue optimism with regards to net zero scenarios.[9] Current climate simulation models may effectively simplify (and thus downplay) social and political realities affecting the actual impacts of climate change.[10] The concept of net zero may also distract attention from the urgency of emission reductions by shifting faith onto unrealistic carbon removal measures.[11] Such technologies are still developing and not yet available for large-scale applications.[12] The promise of carbon removal technologies bolsters market environmentalism narratives that strengthen capitalism and reinforce existing social and spatial inequalities.[13] The stabilization of emissions is a necessary but insufficient condition to manage climate change, and reaching zero emissions will not cancel climate impacts.[14]

5.1.1. The role of scenarios in defining net zero urban futures

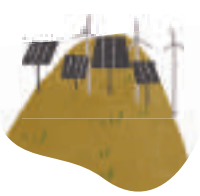
Net zero urban futures depend on the development of net zero scenarios at the national level and how such influence urban thinking. Scenario modelling assists decision-making in climate policy.[15] The latest generation of climate models informs the urgency to reach net zero emissions.[16] These models also outline physical and policy pathways to net zero emissions, including measures to reduce the use of carbon-intense materials (such as substituting materials, facilitating recycling, introducing carbon pricing and removing energy subsidies), support research and development of decarbonized technologies, and sunset policies for obsolete high-carbon facilities.[17]

Solar panels in a car park. Companies are installing renewable energy sources to reduce their carbon footprint. Reggio Calabria, Italy

Net zero decarbonization requires country-specific strategies that take into account each nation's development priorities.[18] In the UK, for example, a study suggests that achieving net zero emissions before 2050 will require more vigorous mitigation efforts than those currently envisaged by national policy.[19] Lines of action should include commercial-scale deployment of carbon capture and sequestration technologies, a quicker phase-out of fossil-based generation, higher deployment of wind and nuclear power, and more radical reductions in emissions from the transport and building sectors. In Latin America and the Caribbean, well-proven strategies can support net zero pathways, including urban electrification for households and transport, transport mode shifting, and the combination of intensive sustainable agriculture with afforestation.[20]

Achieving net zero ultimately depends on subnational and city-level action. Several net zero planning models are currently under development. Building-level carbon budgets, for instance, provide consistency across temporal and spatial dimensions of carbon reductions.[21] Planning for net zero cities depends on having appropriate climate information as part of the evidence base, but this information is not always available. Climate projections can inform decisions in urban planning, which points towards the increasing role that planning can play in shaping urban futures.[22] Innovative models that could support multi-objective decision-making in urban planning and governance, such as scenario-based planning,[23] multiperiod planning,[24] and multi-objective decision-making[25] are in the early stages of development but offer significant promise.

Scenarios can inform protective decisions to mitigate risks. For example, recent modelling shows that over the next 50 years. climate change will likely increase cross-species viral transmission risk, as mammals are driven to cooler regions.[26] Scenarios can also inform proactive decisions to seize opportunities. They can also contribute to consensus building among many actors, broadening support for a complex net zero transition.[27] However, despite the popularity of climate simulation models, policy decisions should not rely solely on the outcomes of quantitative scenario modelling.[28]



Net zero decarbonization requires country-specific strategies that take into account each nation's development priorities

Their results depend on subjective framing of objectives, contexts and methodologies.[29] Building net zero scenarios is particularly challenging because it involves long time frames and detailed speculation on technological and social changes, with inferences across different sectors and processes.[30] Scenario building approaches appear technocratic, limiting actors' agency and mobilizing simplified assumptions about social and political dynamics.[31]

The combination of quantitative models with qualitative storylines is an alternative to move beyond simplified narratives that rely solely on computer modelling.[32] For example, socio-technical transition theories highlight the co-evolution between social change and technological development. Yet, while such analyses expose the historical trends of socio-technical dynamics, they often cannot predict how such dynamics might develop in the future.[33]

Socio-technical scenarios help to bridge computer models, and socio-technical systems theories.[34] Socio-technical scenarios support speculation on future transition pathways, considering actors' agency and the interactions between multiple dimensions (both techno-economic and socio-political) of a socio-technical system.[35] Contributions from the humanities and the creative sector will enhance the creation and deliberation of climate change scenarios towards imaginative futures.[36] This perspective highlights the importance of cultural work on climate change that acknowledges scenarios' historical and cultural roots.[37] However, there have been limited applications of multi-method modelling in urban planning and urban governance so far.

5.1.2. Policies for a net zero urban future

National and subnational governments, international coalitions and private entities have made increasing net zero emissions pledges in the last few years. In May 2021, the International Energy Agency (IEA) released a special report on the pathways toward a global net zero energy system by 2050. The report sets out more than 400 milestones that need to be achieved to reach the net zero goal in the energy sector by 2050. These include major transformations such as increasing the annual clean energy investment worldwide to around US$4 trillion by 2030, halting sales of new internal combustion engine passenger cars by 2035, and phasing out all unabated coal and oil power plants by 2040.[38]

According to IEA, more than 50 countries have set net zero emissions targets,[39] of which 12 countries have written the net zero target into law, including Germany (2045), Sweden

(2045), Canada (2050), Denmark (2050), France (2050), Hungary (2050), Japan (2050), Luxembourg (2050), New Zealand (2050), South Korea (2050), Spain (2050) and the UK (2050). However, some of the strategies have faced criticism of being unrealistic—essentially, being "pie-in-the-sky"—and failing to include policies that would deliver promised cuts in emissions. The UK government, for instance, has been sued separately by two charities—ClientEarth and Friends of the Earth— in this regard.[40] Net zero policies have attracted interest but also courted controversy (Box 5.1).

Box 5.1: Let's make a "Green" Deal: Infrastructure, jobs and the green economy

Several countries—including China, European countries, and the US— have developed policy frameworks, sometimes referred to as "Green Deals," to address the twin challenges of climate change and pandemic recovery, emphasizing job creation and infrastructure investment.[41]

A new infrastructure bill adopted in November 2021 by the US will invest US$1 trillion in ports and transportation systems, high-speed internet, clean water, roads and bridges, mass transit, and clean energy infrastructure, creating millions of jobs. The European Commission also adopted a European Green Deal (EGD) in 2019, later coordinated with the COVID-19 recovery plans in NextGenerationEU, with a strong emphasis on digital technologies.[42]

However, there are questions about the extent to which infrastructure investments are the best approach to deliver a transition, particularly what kind of actions these frameworks will foster at the local level. In the US, ten state and local governments have adopted subnational versions of the Green New Deal, including Austin, Texas; Los Angeles, California; New York City; and Boston, Massachusetts.

In the European Green Deal, cities play a central role in specific strategies such as the Circular Economy Action Plan, the Biodiversity Strategy for 2030, the Farm to Fork Strategy and the Renovation Wave.[43] In 2020, the European Commission announced an EU mission on Climate-Neutral and Smart Cities to deliver 100 climate-neutral and smart cities by 2030 that can act as experimentation and innovation hubs.[44]

Delivering the net zero transition depends on cities, and many cities are willing to work towards net zero. At least 1000 cities worldwide have committed to net zero objectives under the UNFCCC-led Race to Zero campaign.[45] Cities can deliver critical actions to advance social changes, such as modal shifts, infrastructure upgrades, energy efficiency and low-carbon urban forms.[46] However, cities accommodate a fragmented landscape of infrastructure and technology ownership that often cuts across urban boundaries. A net zero transition at the urban level requires both autonomy and coordination.[47] Thus, urban transitions to net zero need to be supported by horizontal integration (multi-actor) and vertical coordination (multilevel).[48]

Policies at higher level governance scales (e.g. regional, national and international) can serve as a guiding framework for city-level actions.[49] An analysis of the climate action plans of 296 cities with net zero targets showed that cities' approaches to net zero evolve within broader governance contexts.[50] Cities in lower-income countries are more likely to rely on local and community actions and focus on climate adaptation and risk management that echoes national-level climate strategies. In contrast, cities in higher-income countries tend to highlight climate actions in transport, buildings and lighting by focusing on efficiency and leadership.[51] Support from national governments is essential (Figure 5.1).[52]

Figure 5.1: National-level pillars for supporting local climate action

Clarifying governance competences	Financial and institutional support	Coordination of multiple actors	Experimental, participatory culture

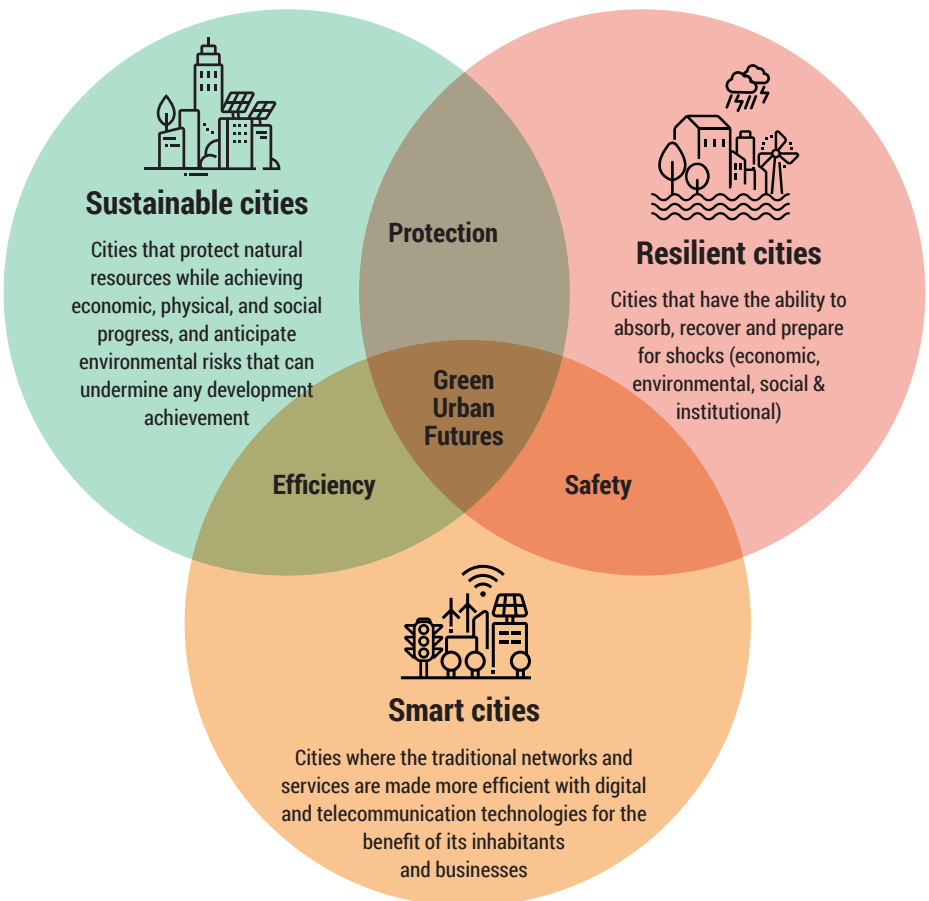
Source: Coalition for Urban Transitions, 2019.

The Sustainable Development Goals are another arena of national commitment that requires local implementation. Cities can coordinate net zero action with localized action to deliver the SDGs. For countries in Africa and South Asia facing dire energy access challenges, delivering a net zero transition must go hand in hand with alternatives that provide energy access to populations with some of the lowest carbon footprints in the world. In 2019, despite progress in advancing SDG7 on energy, an estimated 759 million people still lacked access to electricity and 2.6 billion people lacked access to clean cooking facilities.[53] The IEA forecasts that, as population growth continues in Africa, energy access challenges will continue unabated. While electricity access rates are higher in urban areas, urban dwellers still face energy access challenges related to affordability and reliance, particularly in rapidly growing urban peripheries. Local governments and other urban actors have an essential role in linking the urban net zero transition with other sustainable development objectives such as energy access. Carbon mitigation policies for off-grid energy or energy efficiency directly alleviate some of the energy access challenges.

Moreover, urban areas can help accelerate the net zero transition. For example, the EU's 2050 net zero strategy considers cities as experimentation centres in sectors such as energy, transport, and construction.[54] Different models of low-carbon, sustainable cities developed over the years have been implemented in practice, with rich lessons for net zero cities.[55]

However, existing models of urban development that favour net zero action (as illustrated in Figure 5.2) cater to well-established cities with access to financial resources and advanced technologies such as Singapore, Stockholm or Vancouver, among others. There is less understanding of what net zero will mean for rapidly urbanizing areas

Figure 5.2: Models of net zero development in urban areas



Source: Compiled from Arcadis, 2018; Hassan and Lee, 2015; Barkham, 2013; OECD, n.d.; IMD, 2021; European Commission, 2022.

Net zero action must balance localized interventions in buildings and neighbourhoods with citywide approaches seeking to deliver concerted action

and the growing urban peripheries in Latin America and the Caribbean, Africa, the Middle East, South Asia and Southeast Asia. Yet, rapidly urbanizing areas are accumulating experiences that will become increasingly relevant in the net zero transition.

Net zero action must balance localized interventions in buildings and neighbourhoods with citywide approaches seeking to deliver concerted action. There are several examples of successful localized interventions. The building sector, in particular, is a crucial arena for advancing net zero in cities (Table 5.1). In the European Union, the EU Energy Performance of Buildings Directive (EPBD) requires that all new buildings constructed since the beginning of 2021 must be nearly zero-energy buildings. Achieving such a goal depends on designs with significant energy-saving features, such as efficient heating, ventilation, and air-conditioning (HVAC), and lighting technologies.[56]

At the same time, the retrofitting of the existing building stock constitutes a significant challenge to reducing the GHG emissions of the building sector.[57] Retrofitting the current building stock is often considered a cost-efficient way of reducing building energy consumption.[58] The move from single buildings to the district scale—for example, in Net Zero Energy Districts (NZED)—has shown potential for large-scale emission reductions.[59] NZEDs require innovative solutions for street lighting, urban mobility, waste collection, and public safety.[60] A scenario study in Belgium, for example, identified the importance of building renovation, sustainable mobility, and the integration of local renewable energy

Table 5.1: Reducing emissions in the built environment, examples of actions

Area of action	Rationale	Evidence of progress
Adoption of building codes at the national level	Building codes are generally used in the context of safety but are also helpful in reducing emissions by regulating energy-related components such as thermal performance and wall thickness. They also have dividends for residents, making houses more comfortable and reducing energy bills.	The Global Alliance for Buildings and Construction says that 18 new countries have adopted building codes since 2017 and building codes are frequently cited in Nationally Determined Contributions. The alliance also reports that green building certification increased 13.9 per cent between 2019 and 2020.
Energy efficiency measures	Energy efficiency includes measures to reduce the amount of energy that provides a similar level of service, for example, by changing the technology and materials used or optimizing the system through digital systems. Changing an incandescent lamp to a more efficient LED lamp is one of the simplest examples of energy efficiency measures. The IEA estimates that energy efficiency could provide more than 40 per cent of the emissions reductions needed by 2040.	The Global Alliance for Buildings and Construction estimates that global investment in the energy efficiency of buildings increased an unprecedented 11 per cent in 2020. Still, investments remain concentrated in the EU, and it is thought to be insufficient to bring about a systemic change.
Integrated approaches to cooling	The use of energy for cooling, especially air conditioning systems, has skyrocketed. As global average temperatures increase, the use of energy for cooling is likely to increase. Ways to prevent excessive cooling include developing integrated cooling systems and changing perceptions of thermal comfort.	The Cool Coalition recommends reducing need for mechanical cooling through better building design and urban planning, improving equipment efficiency, shift to renewables and protecting vulnerable populations. While progress in these areas is slow, notable highlights include: 14 cooling suppliers joined the Race to Zero campaign, representing 28 per cent of the residential AC market; 53 enhanced Nationally Determined Contributions have integrated sustainable cooling.
Urban electrification	The WGIII report of the IPCC states: "electrification of energy end uses in cities and efficient energy demand for heating, transport and cooking through multiple options and urban infrastructure has an estimated mitigation potential of at least 6.9 GtCO2-eq by 2030 and 15.3 GtCO2-eq by 2050", but also requires the decarbonization of the energy supply.	The use of heat pumps, photovoltaic energy or electric cookstoves improves energy efficiency and may enable the active decarbonization of the energy supply. Urban electrification may also help reconfigure supply networks more sustainably through smart grids. However, while evidence of the successful electrification of urban transport is apparent, widespread urban electrification in buildings is less clear.

Sources: UNEP, 2021a; UNEP, 2021b; IEA, 2021a; IPCC, 2022a.

Ecological modern building . Warsaw University in Poland.

sources to achieve net zero at the neighbourhood level.[61] There is considerable potential for district-based approaches to net zero. Still, they face two challenges: to move beyond experimental stages in well-resourced cities into broad models that can provide workable alternatives elsewhere and to interrogate how district-based action can be integrated into citywide plans that reflect the changing needs of both city centres and urban peripheries.

The COVID-19 pandemic showed the potential feasibility of net zero ambitions, but public health measures in response to the virus had short-lived effects on reducing carbon emissions. It also demonstrated that efforts to reduce carbon emissions should go hand in hand with ameliorating people's vulnerabilities (see section 5.3). Lockdowns and disruptions in the global supply chain led countries like China to consider measures that effectively decarbonized the economy.[62] In urban areas, COVID-19 'forced' residents to interact with their cities in a more sustainable way, as people shifted to walking and cycling[63] and rediscovered the value of green spaces.[64] However, as emissions have picked up, economic recovery has been prioritized at the expense of net zero investments. A comparison of the economic recovery packages of 149 countries found that investments in net zero transitions are minimal compared with pandemic-related stimulus funds while fossil fuel production support remains strong (Box 5.2).[65]

5.1.3. Social change is central to a net zero urban transition

Lasting reductions in greenhouse emissions require social change.[66] Demand-side solutions for mitigating climate change include strategies targeting technology choices, consumption, behaviour, lifestyles, production-consumption infrastructures and service provision.[67] Demand-side mitigation strategies are critical to meet emission reduction targets and often entail fewer environmental risks than many supply-side measures.[68] Since they depend on interactions between technological

efforts to reduce carbon emissions should go hand in hand with ameliorating people's vulnerabilities

and social change,[69] net zero transitions are value-laden and depend on societal preferences.[70] Social change manifests in individual-level social behaviours, practices (e.g. everyday eating or mobility), and broader social relations and structures.[71] The IEA, for example, has proposed changes in urban areas, such as phasing out internal combustion engine cars and promoting ridesharing for all urban car trips.[72]

However, the contributions of behavioural change to net zero are limited. Behavioural change in urban areas (e.g. replacing car trips with walking, cycling or public transport, or foregoing long-haul flights) could provide around 4 per cent of cumulative global emissions reductions.[73] Alternatively, urban communities can play an active role in transition processes e.g. through spawning urban innovation, participating in political coalitions for change or redefining how they engage with infrastructure and markets.[74] Such a transition would require moving away from conceptualizing urban dwellers as consumers who influence the transition via consumer choices and instead recognize people as active makers of their urban environments.

Net zero transitions also involve a broader change in the cultural, legal and institutional frameworks that guide the production and use of technology, the everyday practices of organizations and consumers, and design choices for products and infrastructures.[75] In addition, social movements may foster innovation and transitions towards net zero.[76]

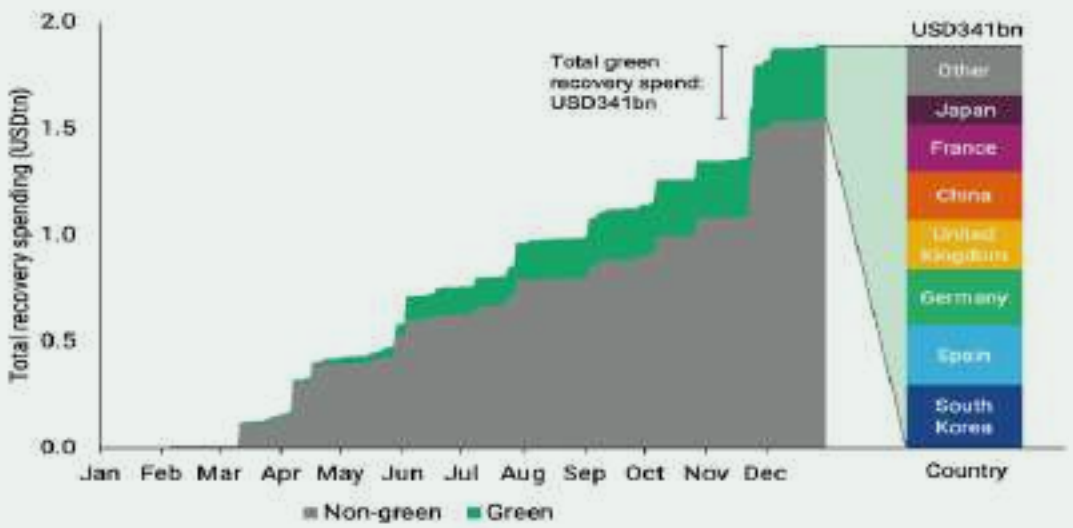
Market-based incentives and voluntary agreements are insufficient to bring about this kind of social change in urban areas.[77] Instead, local governments should implement

Box 5.2: Green recovery: Commitments and actions misaligned?

Evidence suggests that amidst the call for greener urban futures, global green spending is so far incommensurate with the scale of ongoing environmental crises. A recent study by UNEP of the 50 largest national economies found that only US$368 billion of US$14.6 trillion COVID-induced spending—or just 2.5 per cent of total spending (both rescue and recovery)—in 2020 was green while only 18 per cent of recovery spending was considered so.

Moreover, reports also show that 15 major producer countries continue to provide significant policy support for fossil fuel production; their production plans and projections would lead to about 240 per cent more coal, 57 per cent more oil, and 71 per cent more gas in 2030 than would be consistent with limiting global warming to 1.5°C.

Recovery spending over the course of the pandemic with total green spending, 2020



Source : UNEP, 2021c; SEI et al, 2021.

effective public policy measures such as carbon taxes, building codes, congestion zone charging and subsidies for renewable consumption.[78] However, these measures alone are not sufficient to cause wider social change and they may have negative consequences for vulnerable populations. Ultimately, inclusive planning has a crucial role in fostering a societal transition to net zero (see section 5.5).

5.2. The Future of Urban Transportation

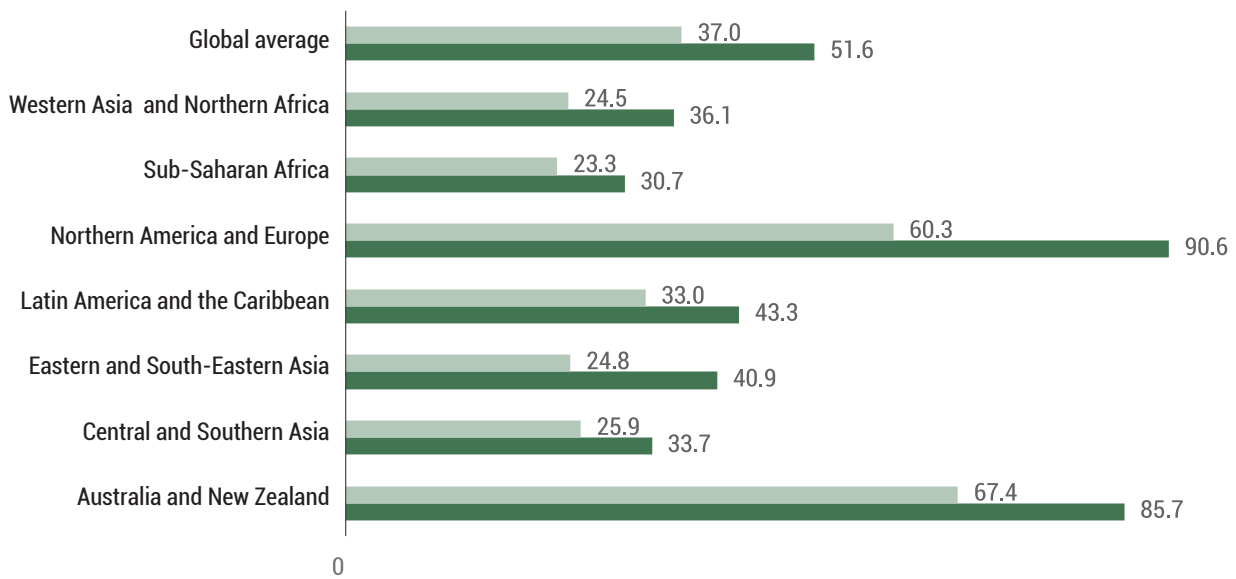
Greenhouse gas emissions from transport are increasing faster than any other energy-using sector. The transport sector accounted for 27 per cent of global emissions in 2019.[79] While the restrictions and lockdowns associated with COVID-19 pandemic resulted in a fall in CO_2 emissions from the global transport sector, rebounding demand and anticipated growth are resulting in a steady rise of emission to pre-pandemic levels. Of special concern are road transport emissions, as three-quarters of current global greenhouse gas emissions from the transport sector are generated by road transport alone.[80]

Securing greener urban futures will require planning for sustainable transport and mobility within and beyond cities to reduce energy consumption, air pollution, noise and GHG emissions. Sustainable mobility can also improve people's health and well-being, for instance, through active travel modes like cycling and walking and by reducing commuting time. Sustainable urban mobility depends on the provision of low-carbon transport infrastructure, the introduction of energy-saving technologies and the design of adequate transport planning frameworks.

The pursuit of greener urban futures calls for transport policies that encourage a shift from private cars to public transport, shared vehicles or active travel. Yet, data for 2020 from 1,507 cities from 126 countries shows that, on average, only about one-half of the urban population has convenient access to public transport (Figure 5.3). Often, most people in cities are unable to access sustainable transport options, public or private, due to lack of appropriate infrastructures or individual conditions (e.g. living with disabilities, old age or gender-based restrictions), among other reasons.

Moreover, it is often the poorest communities who depend on cycling and walking. In cities like Addis Ababa, Nairobi, Dar es Salaam or Lagos, more than 40 per cent of the population depend on cycling and walking for their mobility.[81] Thus, sustainable transport futures require looking beyond regulated transport infrastructure provision and planning for diverse mobility needs.[82] Holistic approaches will require more than just "magic bullet" technologies like electric vehicles. The expansion of transportation networks will require strategies that mix public transport options and car-sharing, as well as incentives to encourage non-motorized

Figure 5.3: Public transport: coverage and share of population with convenient access, 2020



Source: Data Analytics Unit, UN-Habitat.

travel and reduce the need to travel over long distances (Table 5.2). Addressing cities' reliance on private transport requires the consideration of complex mobility needs of urban communities. Challenges in the shift to clean transportation include affordability, convenience, ease of travel, availability of different options, the distance between housing and workplaces and personal safety issues.

5.2.1. Public health and the challenges of congestion and air pollution in cities

Traffic congestion and air pollution represent key health challenges for cities worldwide, as urban areas expand to accommodate a growing population. Unplanned urban expansion, the public's reliance on motorized road transport and high volumes of freight transport to meet urban consumption contribute to maintaining high levels of air pollution.[83] According to the World Health Organisation (WHO), air pollution—ambient and household air pollution—is linked to 7 million premature deaths, annually.[84] WHO estimates also show that 99 per cent of the world population breathes air containing a high level of pollutants (exceeding WHO guideline limits), with in low- and middle-income countries more affected.[85]

Urban air pollution can result in adverse health outcomes, such as heart attacks, strokes, cancer and chronic obstructive pulmonary disease. There is growing evidence that air pollution affects children's neurological development. In a 2018 report, WHO estimated that 93 per cent of the world's children are exposed to toxic air daily, putting their health at risk.[86] Acute lower respiratory infections caused by polluted air has been linked to the death of 600,000 children in 2016. Vehicular traffic congestion poses other public health risks, including exposure to excessive noise, elevated ambient air temperatures and reduced physical activity.[87] Researchers estimate that around 2.1 million deaths can be attributed to insufficient physical activity every year,[88] while accidents involving motorized vehicles are responsible for approximately 1.35 million deaths annually.[89]

Reducing traffic congestion can positively impact emissions reductions objectives and urban dwellers' health. Measures to reduce traffic congestion include reallocation of road space to non-motorized transport, congestion charging to reduce the presence of polluting vehicles in cities, incentives for walking and cycling, public transport provision improvements and car-free days (Box 5.3). Integrating health impact scenarios into

Table 5.2: Approaches to sustainable urban mobility

	Approach	Goal	Examples
Rapid Transit Systems 	Rapid transit systems operate on a fixed route that increases the service's speed, capacity and reliability. They include rail transit systems (overground and underground) as well as bus systems operating on segregated lanes (not accessible to cars)	Ease traffic congestion	Investments in low-carbon bus rapid transit systems, light rail and underground systems
Vehicle and Fuel Switching 	Vehicle switching refers to incentives (subsidies or taxation) that encourage switching to low-carbon private cars and public transportation systems.	Reduce GHG emissions and air pollution	Subsidies for electric cars; introduction of low-emission zones (extra charge for diesel vehicles driving in certain areas), developing charging stations for electric vehicles, public investments into electric/hydrogen-fuelled public transport systems (e.g. buses), etc.
Active Travel Promotion 	Active travel promotion refers to initiatives that encourage walking and cycling for daily trips and discourage private cars.	Reduce GHG emissions and air pollution, enhance public health, disincentivize private car use for short trips.	Reallocation of road space for walking and cycling; regular road closure to create "play streets"; car-free days.
Shared/ collective transport 	Collective transport represents an alternative to private car ownership and public transportation for trips not well covered by existing public transportation networks.	Address gaps in public transportation networks; disincentivize private car ownership.	Digitally enabled carpooling and car-sharing, but also regulated and informal collective taxis or mini-buses.

Box 5.3 Car-free and carefree: The movement to open streets for people

While no major city has banned cars permanently, a combination of policy responses to energy price shocks, advocacy for human-scale urbanism and strong mayoral leadership have strategically limited when and where cars can occupy streets and other urban public spaces. In 1973, the governments of Denmark, the Netherlands, Switzerland and West Germany enacted a series of "car-free Sundays" to conserve scarce gasoline during the OPEC oil embargo. The next year, Bogotá (Colombia) residents petitioned their government for bicycle-only paths on Sundays. That effort planted the seeds for what in the 1990s became an expanded car-free Sunday known as Ciclovía (Spanish for "cycle way"), which closes approximately 120 km of streets to cars and opens them up to people for cycling, walking, rolling, vending, exercise and other non-motorized uses.

The car-free Sunday concept spread beyond Bogotá and has proven exceptionally popular in cities across the developing world where urban residents traditionally have less access to leisure and recreation opportunities. Jakarta (Indonesia) adopted car-free Sundays in 2012, while several Indian cities have tried with mixed results. In Africa, Kigali (Rwanda) introduced car-free Sundays as a monthly event in 2016 which, due to its popularity, became fortnight occurrence. The Ugandan cities of Kampala and Jinja take an explicit stance with the theme "I am the solution to pollution and traffic in my city," while the car-free days are annually observed in Addis Ababa and other major cities in Ethiopia.

This enthusiasm in the developing world is matched by increasing efforts in developed world cities to remove cars from certain parts of cities. In recent years, Paris has banned cars from a roadway along the Seine River, Oslo and Amsterdam have removed parking spaces from the city centre, and Barcelona has pioneered the "superblock" urban design model that prioritizes people over cars on certain blocks. The need for social distancing during the COVID-19 pandemic provided additional motivation to allocate public space for people rather than cars. Milan announced the reallocation of 35 km of streets and road space to walking and cycling, while Paris announced the conversion of 50 km of roads into cycling infrastructure.

Meanwhile, in a flashback to the 1970s, the IEA has proposed car-free Sundays as a measure to reduce oil consumption during the oil price shock of 2022. This recommendation illustrates how much the car-free city concept resonates in public discourse about energy savings and improving urban environments. However, scientific analysis of car-free days is scant, with little empirical evidence on how much such events reduce environmental degradation, even if they capture the public's imagination.

Source: Whitney, 1973; Guillermoprieto, 2019; UNEP, 2020a; Peters, 2020; IEA, 2022; Glazener et al, 2022; COVID Mobility Works, n.d.

sustainable transport planning is essential to secure greener, healthier and safer futures for everyone.

Urban dwellers are unevenly affected by the negative impacts of congestion and air pollution, as low-income groups, children, women and girls, and the elderly are often more vulnerable. Environmental justice research shows that schools in low-income neighbourhoods are more likely to be located near polluting infrastructure.[90] Low-income groups also face limited transport and mobility options and endure longer and more expensive commutes relative to their income.[91] Women and sexual minorities are more likely to face harassment in public spaces and public transport, during the day and night. The mobility of people living with disabilities, the elderly, and children is also significantly hindered in many cities.

Therefore, equity and safety issues must inform interventions that encourage active travel and public transport. In addition, modelling tools and future scenario assessments that account for differentiated mobility needs and uneven access to different transport modes are required to make cities safer, more sustainable and liveable for everyone.

5.2.2. Rethinking futures in transport planning

Transport planning requires navigating uncertain futures shaped by climate change, economic instability, travel demand, changes in individuals' behaviours and preferences, technological disruption and global pandemics. Designing sustainable transport systems in cities requires a mix of qualitative and quantitative tools involving a wide range of stakeholders in order to define collective futures. Decision-makers can design policy with the help of tools that can

anticipate future travel demand and measure the impact of particular interventions. Quantitative tools include model sensitivity analysis, stochastic modelling, Monte Carlo simulations and Bayesian Networks. Qualitative tools include Delphi methods, road mapping, backcasting and scenario planning.

A high degree of flexibility and adaptability is required to navigate deep uncertainty.[92] Quantitative transport planning tools such as forecasting (anticipating future travel demand based on past trends) do not cope well with the uncertainty brought about by unexpected events like the COVID-19 pandemic, long-term trends with a wide range of potential impacts like global climate change and rapid urbanization, and accelerated technological innovation in the transport sector. A review of 210 infrastructure projects across 14 countries concluded that forecasters often overestimate future transport demand.[93]

Scenario planning is a means to shift current sustainable mobility and transport planning practices from regime-compliant (adhering to past trends in the transport sector and transport policy) to regime-testing (making transgressive policy decisions for sustainable futures).[94] Scenario planning integrates both quantitative and qualitative planning tools to design transport interventions and stakeholders' views.[95] Traditional forecasting methods are used alongside more qualitative assessments of plausible and desirable futures. A complementary technique is backcasting, which identifies desirable objectives (e.g. achieving zero-carbon emissions through mobility planning or enhancing access to reliable and affordable transport) and works backward to build a series of steps and interventions to achieve those over a specific timeframe.[96]

Achieving sustainable transport systems in complex urban environments requires integrating transport planning with other policy domains. For instance, health impact assessments (HIAs) are integrative modelling tools to mainstream public health concerns into policy. However, urban dwellers are rarely involved in the development of HIAs for urban and transport planning.[97] Involving people in decisions relating to public health improves the efficacy of any interventions and, in the case of sustainable mobility, can help include people as active agents in a collective modal shift towards active travel.

Achieving sustainable transport systems in complex urban environments requires integrating transport planning with other policy domains

Synergistic scenario planning integrates transport planning within broader planning efforts towards carbon neutrality at the city and regional scale.[98] Such integrative tools conceive transport as one aspect in the large-scale socio-technical transformation of the energy, transport, industry and building sectors.[99] Synergistic scenario planning creates bridges between different policy domains that play a role in securing greener urban futures—including transport—and helps align actors' interests to build partnerships and share goals. The involvement of stakeholders is essential to identify drivers of change (e.g. energy prices, technological costs, people's preference for different transport modes) and to assess the feasibility of different scenarios. Urban dwellers' participation in transport planning is essential to avoid an over-emphasis on a small set of transport options and one-size-fits-all prescriptions that bear very little relevance to the implementation sites.

Practical experiences show that scenario planning for land-use and transport decisions has mixed results, especially without inclusive and participatory frameworks, clear implementation plans and resources, and adequate institutional structures.[100] Most practical experiences in scenario planning are in North American and European cities, where they rarely address the challenges of informality and rapid urban growth. As a result, most future visions on urban transport emphasize technological solutions, whose effectiveness is not always proven: freight or passenger transport with small airborne vehicles such as drones, flying cars or taxis;[101] smart traffic management systems that enable vehicle-to-infrastructure communication to ease congestion and facilitate intermodal travel;[102] and autonomous vehicles, connected cars on shared mobility platforms.[103]

However, the most effective responses are relatively low-cost and/or low-tech: better planning regulations; introduction of low-emission zones; support for cycling and walking; and rapid transit systems. Low-cost responses are particularly relevant in highly unequal cities where most people do not have access to private cars or public transport and thus rely on walking, cycling or informal taxis. The COVID-19 crisis has also fostered low-tech, low-cost measures such as pedestrianizing streets, expanding cycle lane networks or implementing low-traffic neighbourhoods as means to encourage safer, healthier and less polluting forms of travel.

In conclusion, scenario planning is a promising tool to navigate uncertain futures. Still, it only works alongside

Low-tech interventions should have a prominent role alongside other widely promoted high-tech solutions

inclusive, participatory processes that ensure all urban dwellers— particularly those with limited access to different travel options—can take part in the definition of urban futures.[104] Travel demand forecasting tools do not easily capture many mobility practices, such as informal transport and active modes of travel. Low-tech interventions should have a prominent role alongside other widely promoted high-tech solutions. Future transport planning will need to integrate, above all, adaptability and flexibility through consistent evaluation frameworks to guide decisions in a context of uncertainty.[105] Importantly, holistic transport planning approaches and frameworks such as Sustainable Urban Mobility Plans (SUMPs) as well as the embrace of concepts like the 15-minutes neighbourhood (discussed in Chapter 6) should be viewed and promoted as vital to securing a greener urban future.

5.2.3. Inclusive mobility at the forefront

Achieving greater justice and sustainability through future transport and mobility planning will require decision-makers to recognize that not everyone can access transport and mobility options in the same way. Thus, there is greater interest in developing transport strategies with groups whose experiences have traditionally not been included in traditional transport planning, which tends to assume that users of urban mobility are able-bodied males.[106] For instance, not everyone can shift transport options depending on their income or avoid travel entirely. During the COVID-19 pandemic, informal and essential workers in urban areas had no choice but to go to work on public transport.

Local governments can make a big difference in opening cities and urban areas to cater to diverse mobility needs with minor neighbourhood investments. Simple measures make a tangible difference, such as street and sidewalk repairs, pavement widening, ramp installation, step-free access to public transport, and well-designed wayfinding signage to facilitate access for people with specific mobility needs, from wheelchair users to caregivers with pushchairs to older persons to the visually or aurally impaired.

In addition to physical infrastructure improvements, affordable fares facilitate public transport access. Many cities have free or subsidized fares for low-income riders, youth and older persons. Tallin (Estonia) introduced free transport for its residents in 2013. The initiative was so successful that it was expanded nationally in 2018. However, undesirable effects included shifts from active travel to public transport

Bicycle sharing station in New York © Shutterstock

for some users, new pressures on the network to meet new users' needs, and limitations on revenues for further improvements.[107]

Safety is vital to sustainable mobility. Ensuring that streets and public transport are safer for everyone is a challenge that requires urban design interventions

Safety is vital to sustainable mobility. Ensuring that streets and public transport are safer for everyone is a challenge that requires urban design interventions. Some groups like women, sex workers, and gender and sex non-conforming people face exclusion from public spaces and roads because they are unsafe. Several cities have started to act on those issues, particularly addressing street harassment against women and harassment in public transport. Torreón, Mexico, has partnered with women's groups, municipal workers, and UN Women to develop new mobility regulations that safeguard women and girls' safety in public transport. The mobility regulations serve as a code of conduct for transport authorities, staff, and passengers and entails compulsory training on gender violence for public transport workers. [108] The city of Cairo, Egypt, includes gender assessments in transportation design, facilitating the creation of safer routes for women using public transport. These efforts range from collecting new data (e.g. sex-disaggregated data that reflects women passengers' experiences), promoting women's view in the decision-making process and designing gender-responsive interventions (e.g. last-mile safe footpath to bus stops).[109]

5.2.4. Integrating informal transport systems

Often, mobility planning tools struggle to account for informal transport systems. Informal transport and paratransit systems (e.g. shared taxis operating based on riders' destination and minibuses operating on fixed routes) are central to support the mobility needs of millions of people.[110] In cities like Kayseri, Turkey, the informal sector may account for 60 per cent of urban trips, and in some African cities such as Dakar or Freetown, over 90 per cent of daily trips depend on informal transport.[111] The rise of private-sector app-based ride-hailing services such as Careem, Grab and Uber poses challenges with regards to the nature and dynamics of formalization that is required in urban transport.

Informal transport systems exist alongside or instead of formal, public or private transport provision systems. Whether run by independent operators or larger cartels, informal transport typically operates outside regulatory frameworks as few developing countries have resources to enforce rules and requirements for transport sector.[112] However, operators often self-regulate through "unions" that "police" operations on specific routes or terminals.

Informal and paratransit systems tend to be used by the urban poor and the middle class, especially when public transport options are limited. They play a fundamental role in filling the gaps in peripheral urban areas, which are often overlooked in public transport networks. For example, mothers and caregivers in Abidjan tend to use informal collective transports to drop their children at school.[113] Informal transport offers urban dwellers different vehicle types, including minibuses, collective taxis and both motorized and non-motorized two or three-wheelers (Table 5.3). However, the informal transport sector faces safety and pollution issues because vehicles are not regularly replaced or maintained.

Informal transport networks should be integrated into future transport planning, with adequate provisions to support improvements in safety and reduction of polluting emissions. Combining formal and informal transport provision may be effective. Informal transport networks can link urban dwellers living in underserved areas to public transport hubs, avoiding the need to expand public infrastructure networks and building on what already exists.

Countries such as Senegal and the Philippines have introduced stricter regulations to force minibus drivers to buy less polluting vehicles. While these measures can encourage the decarbonization of popular transport modes, they also jeopardize the livelihoods of drivers and operators, for instance, without adequate subsidies and financial incentives to switch vehicles. Local governments can work with operators, drivers, and passengers to plan safer, more efficient routes or to facilitate upgrades to cleaner vehicles and fuels.

Informal transport networks should be integrated into future transport planning, with adequate provisions to support improvements in safety and reduction of polluting emissions

Table 5.3: Informal transport examples

Informal transport mode	Usage	Examples
Minibus/Jitney	Operates on fixed routes, following semi-fixed schedules. Can accommodate 12 to 24 passengers and operate across long distances (beyond the neighbourhood)	Examples of minibus/jitneys include *cars rapide* (Dakar), matatu (Nairobi), jeepneys (Manila), dolmus (Istanbul)
Microbus/Pick-up	Operates on fixed routes, following semi-fixed schedules. Can accommodate 4 to 11 passengers and operate across long distances (beyond the neighbourhood)	Examples of microbus include *mikrolets* (Jakarta), *Selman* (Hanoi)
Three-wheeler/Motorcycle/Collective Taxi	Operates on variable routes at variable schedules, demand driven. Can accommodate 1 to 4 passengers and operates at the neighbourhood level).	Examples of three-wheelers include *bajajs* and *bemos* (Jakarta), rickshaws (Dhaka)
Pedicab/Horse cart	Operates on variable routes at variable schedules, demand driven. Can accommodate 1 to 6 passengers and operates at the neighbourhood level).	Examples of pedicabs include *becaks* (Jakarta) Examples of hores carts include *calesas* (Manila)

Sources: Kumar et al, 2021; Cervero, 2000.

Policymakers face three options to manage the informal transport sector:[114]

- Ban operations and run the risk of displacing service provision to new locations.
- Accept the existence of informal transport systems without addressing the challenges they pose, particularly air pollution and congestion.
- Integrating and improving existing systems into urban and metropolitan mobility planning and service provision.

The third option will be the most effective to deliver inclusive and sustainable mobility.

5.3. Embracing Resilience for Greener Urban Futures

The 5th IPCC Assessment Report highlighted the vulnerabilities of urban areas to climate change impacts and identified opportunities for incremental and transformative adaptation.[115] The Special Report on Global Warming of 1.5°C pointed towards risks in urban areas, particularly in unplanned and informal urban settlements.[116] The contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate states that human influence on the climate system is now "an established fact" and its impacts are already apparent.[117] Urban areas will be affected directly (for example, by frequent extreme climate events, sea-level rise and increased probability of flooding) and indirectly (for example, by large-scale ecosystem and social processes such as migration or disruption to supply chains). New findings on the relationship between regional and urban climate suggest that unplanned and unsustainable urbanization patterns also exacerbate impacts such as heatwaves and precipitation.

5.3.1. Safety and resilience in urban policy

Safety and resilience have become essential themes in urban sustainability policy. The Global Commission on Adaptation argues that an investment of US$1.8 trillion from 2020 to 2030 could generate US$7.1 trillion in total net benefits.[118] Urban areas already require investments in climate-resilient infrastructure to improve housing, transport, water, sanitation, drainage and waste management. Whether or not urban areas can meet adaptation challenges, adaptation actions will not happen without consequences and differential impacts are already palpable across urban areas.

Adaptation and resilience agenda is interlinked with development agendas. The 2030 Agenda for Sustainable Development tied "sustainable cities and communities" to both safety and resilience (SDG 11). The New Urban Agenda highlighted cities' importance to "reduce vulnerability, build resilience and responsiveness to natural and human-made hazards and foster mitigation of and adaptation to climate change." Adaptation will likely be a salient challenge for cities in the 21st century.

Adaptation is also redefining the urban economy. Local and regional governments, businesses, and citizens will seek to protect human lives, livelihoods and material assets. Many are working to transform adaptation burdens into financial and innovation opportunities. However, adaptation and resilience are intrinsically linked to the need to deliver fairer, more inclusive urban futures.

adaptation and resilience are intrinsically linked to the need to deliver fairer, more inclusive urban futures

5.3.2. Inequitable distribution of environmental burdens

Disadvantaged groups bear a disproportionate burden of environmental risks in cities. The urban poor worldwide experience higher exposure to health risks through lack of access to clean water[119] and exposure to outdoor air pollution,[120] toxic materials,[121] waste,[122] and indoor air pollution due to limited access to clean fuels.[123] Low-income neighbourhoods also frequently have less access to environmental resources, such as green space[124] and clean energy.[125] The depictions by country in Map 5.1 to Map 5.4 paint a highly unequal landscape of access to water and sanitation.

The risks to the urban poor are likely to worsen in the future. The urban poor are more vulnerable to the impacts of climate change as they often live on sites that are more exposed to extreme weather events (e.g. flooding, landslides, extreme heat and cold) and with limited access to secure housing and other protective amenities (e.g. health care, water and sanitation services, and social protection).[126] Climate impacts are linked to many different risks, which disproportionately affect informal settlements and low-income neighbourhoods, such as water scarcity[127] and exposure to infectious diseases.[128] Groups that are exposed to these risks include children,[129] women,[130] the elderly[131] and communities suffering racial or ethnic exclusion.[132] Environmental risks also disproportionately impact groups already experiencing a lack of security, for example, due to low and unstable incomes, exclusion from social protection systems, or exposure to violence, including urban refugees[133] and migrants.[134]

Flooded street in Dhaka, Bangladesh © Shutterstock

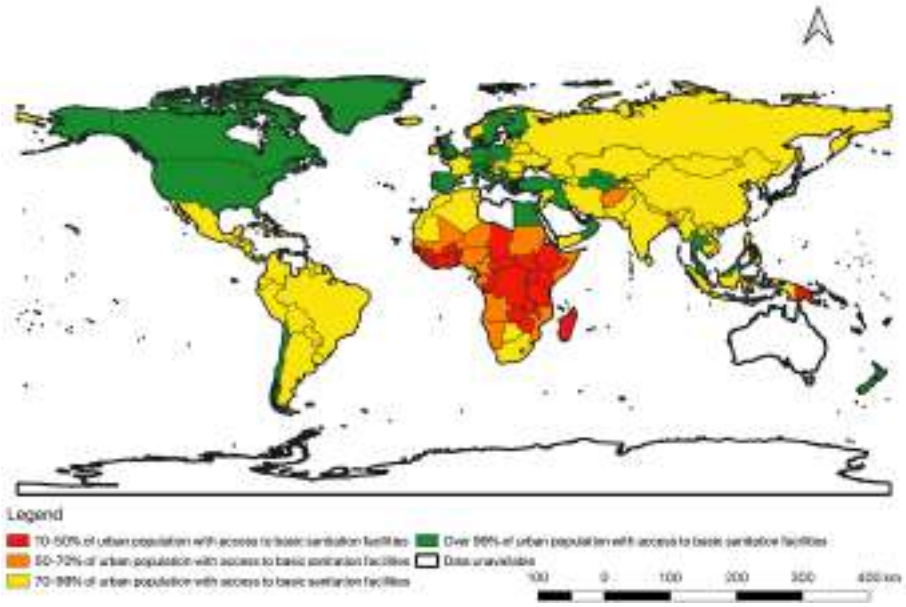
Box 5.4: Urbanization and climate impacts

The latest IPCC report documents the impacts of climate change on urban areas, which will suffer extreme events such as heatwaves, sea-level rise, storm surge from tropical cyclones and intense rainfall. The combination of more frequent extreme events and future urban development suggests that climate change adaptation has become the main priority for local governments.

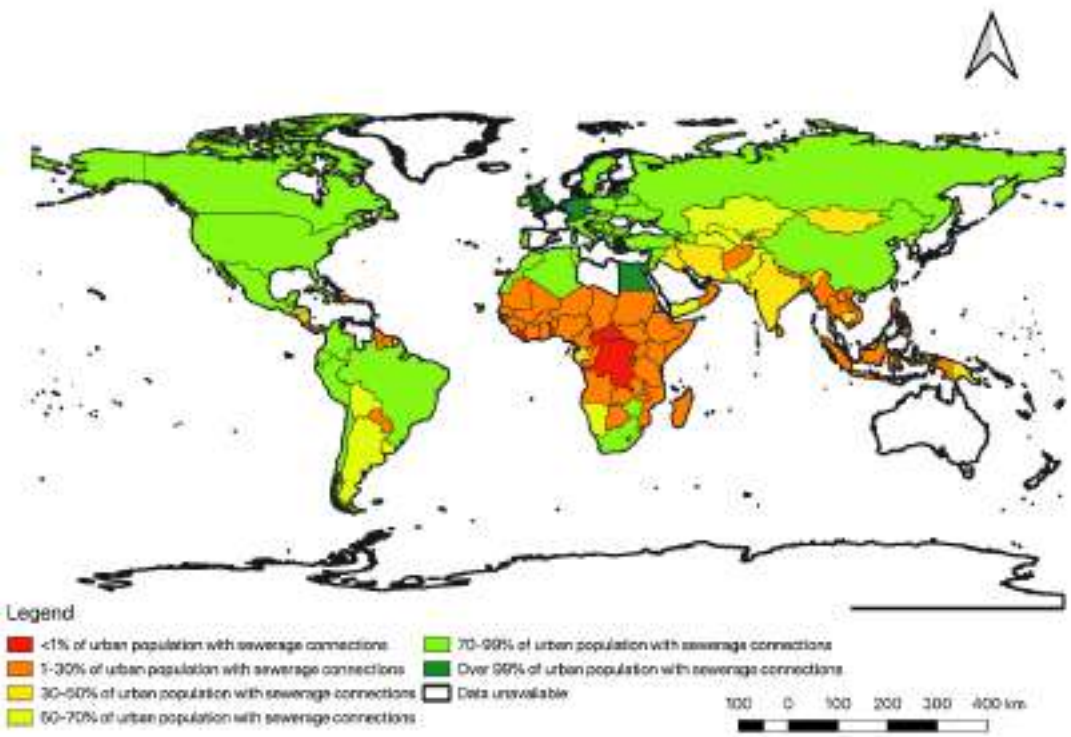
Moreover, the latest IPCC report documents the complex interactions that influence the expression of climate impacts in urban environments, for example, in the heat island effect or the alterations of the water cycle in urban environments. It highlights the compounded risks that are also likely to affect cities, such as the intensification of warming and mean precipitation. Additionally, a combination of increases in relative sea level and storm surge from tropical cyclones increases the probability of coastal city flooding.

Source: Global Commission on Adaptation, 2019; IPCC, 2021.

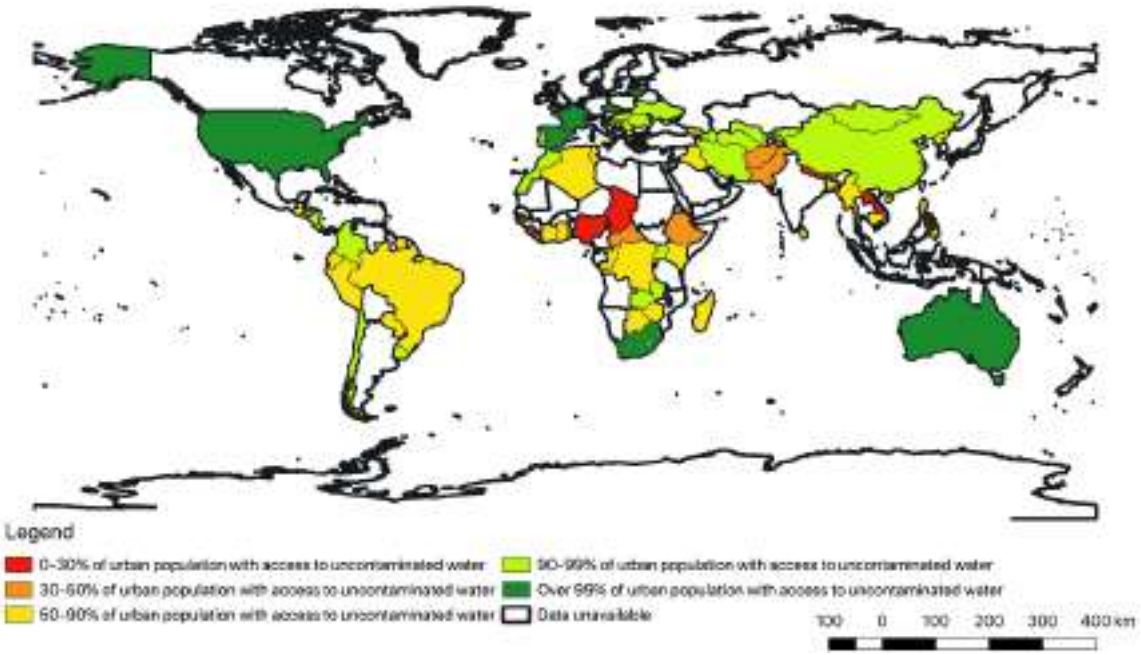
Map 5.1: Percentage of urban population with access to basic sanitation facilities by country



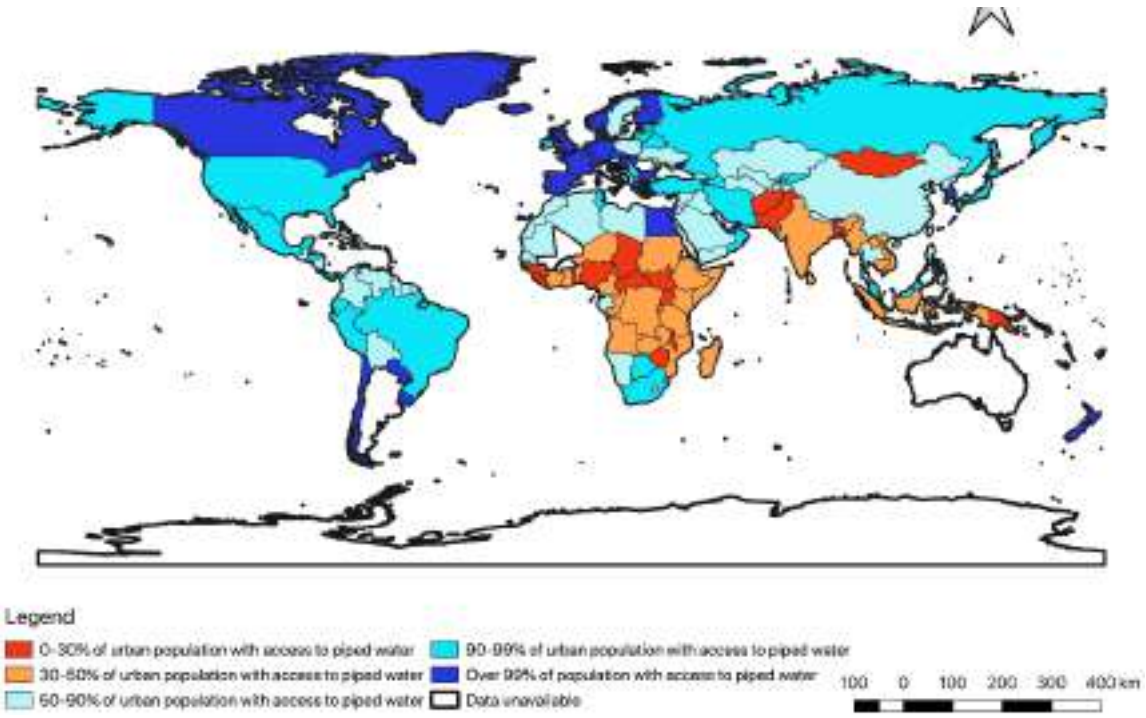
Map 5.2: Percentage of urban population with sewerage connections by country



Map 5.3: Percentage of urban population with access to uncontaminated water by country



Map 5.4: Percentage of urban population with access to piped water by country



Source: Data Analytics Unit, UN-Habitat

5.3.3. Urban climate adaptation planning

Urban climate adaptation planning is "the purposeful development by local governments of activities and strategies designed to reduce the effects of climate change on natural, built, and social systems."[135] There are multiple options for climate adaptation in cities, such as water management, land-use planning and green infrastructure.[136] Cities have no choice but to adapt to climate change.[137] A new paradigm is emerging in adaptation planning that recognizes climate change as an ongoing, dynamic phenomenon in contemporary societies requiring multiple actions, feedback and adjustments. As the well-being of the city entails multiple dynamic processes (economic transactions, social interactions, resource use) and a diverse set of actors, the pursuit of a climate-resilient future requires adaptation planning that works for everyone (Figure 5.4).

the pursuit of a climate-resilient future requires adaptation planning that works for everyone

A central challenge to this paradigm is the amount of available urban land and how it is used, which influences the potential to address environmental impacts as well as urban inequality.[138] Global data on urbanization patterns indicate a continuous rate of urban expansion, also known as urban sprawl, as cities consume land at a faster rate than the growth of their populations. As such, building denser urban areas is generally understood as a more sustainable urban growth model.[139] However, density also influences the patterns of infrastructure distribution and shapes urban inequities (see Chapter 2).[140]

Planning for resilience must also take into account the physical and institutional context of urban planning. A recent study of climate-resilient cities in India examined urban climate action plans developed by thirteen municipal corporations (Table 5.4).[141] Such plans usually emerge with support from national or international funding or as part of broader developmental agendas. While each plan focuses on different problem areas (such as energy, carbon sequestration or urban green spaces), these plans rarely reflect the contextual peculiarities of the city but rather reproduce statements made by the National Action Plan on Climate Change (NAPCC). Most of these plans rely on technological and built infrastructural interventions while overlooking the potential of nature-based solutions or consideration of local knowledge bases, ecologies and processes.

Figure 5.4: Characteristics of inclusive adaptation planning

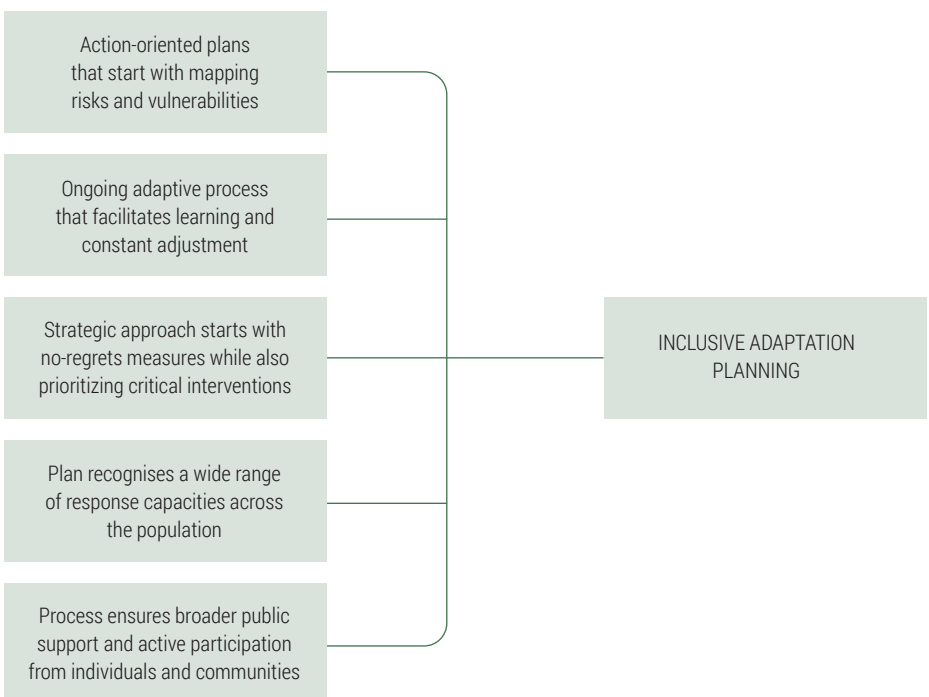


Table 5.4: Climate planning in Indian cities

Type of plan	Cities	Problem areas	Broader influence on urban agenda	Governance issues represented	Governance issues missing
Carbon neutral city plans	Pune	Renewables, Carbon sequestration	NAPCC – National Action Plan on Climate Change	Urban agenda State centre relationships	International relationships
City development plans	Nagpur	Pollution Water Gardens Open spaces Disasters Climate change Sustainable development	PM Council on Climate Change	Urban agenda	State/Centre relationships International relationships
Resilient city plans	Gorakhpur Indore Chennai Kolkata Surat Vizag	Water Health Disasters Solid wastes Energy Transport Low carbon Green cover Resource stress Non renewables	NAPCC/SAPCC/Asian cities climate resilience network/ ADB funding strategy	Urban agenda State centre relationships	State/Centre relationships International relationships
Disaster management plans	Koraput	Floods Fire Drought Heat	Disaster Management Act, 2005	Urban agenda State/centre relationships	International relationships
Environment status reports	Chandrapur Nanded	Pollution Solid waste Mining Health	MoEF directives MPCB directives	Urban agenda	State/Centre relationships International relationships
Heat action plans	Ahmedabad Hazaribagh	Heat	Disaster Management Act, 2005	Urban agenda State/Centre relationships	International relationships

Source: Unnikrishnan and Nagendra, 2021.

5.3.4. Tools to deliver climate-resilient urban futures

Urban adaptation responses often emphasize the development of climate-resilient infrastructure.[142] Climate-resilient infrastructure is planned, designed, built, and operated in ways that take into account climate-related variability to withstand future climate-changed conditions.[143] Resilience will involve measures related to the design of new infrastructures and the retrofitting of old ones, from ICT networks to housing. Digitalization, for example, is increasingly seen as mediating more responsive infrastructure systems but exposes infrastructures to new risks and dependencies.

Standard urban adaptation measures include water storage, flood defences, and water supply and sanitation, alongside housing and spatial planning. For example, basic infrastructures such as water and sanitation remain a significant concern because of their impact on achieving other SDGs and because they impact directly on people's ability to cope with disasters. As Map 5.1 to Map 5.4 show, there is still a substantial deficit in water and sanitation access in several regions of the world, especially Sub-Saharan Africa. Figure 5.5 and Figure 5.6 further shows that urban populations have the highest rates of access. Still, these statistics hide highly uneven patterns of access, as heterogeneous systems of provision dominate the urban environment. Moreover, the definitions of improved access may range widely and includes many people who depend on water kiosks or tanks or having shared facilities: facilities may exist in the proximity but that does not automatically guarantee that urban populations have their needs covered.[144]

Figure 5.5: Access to basic water facilities

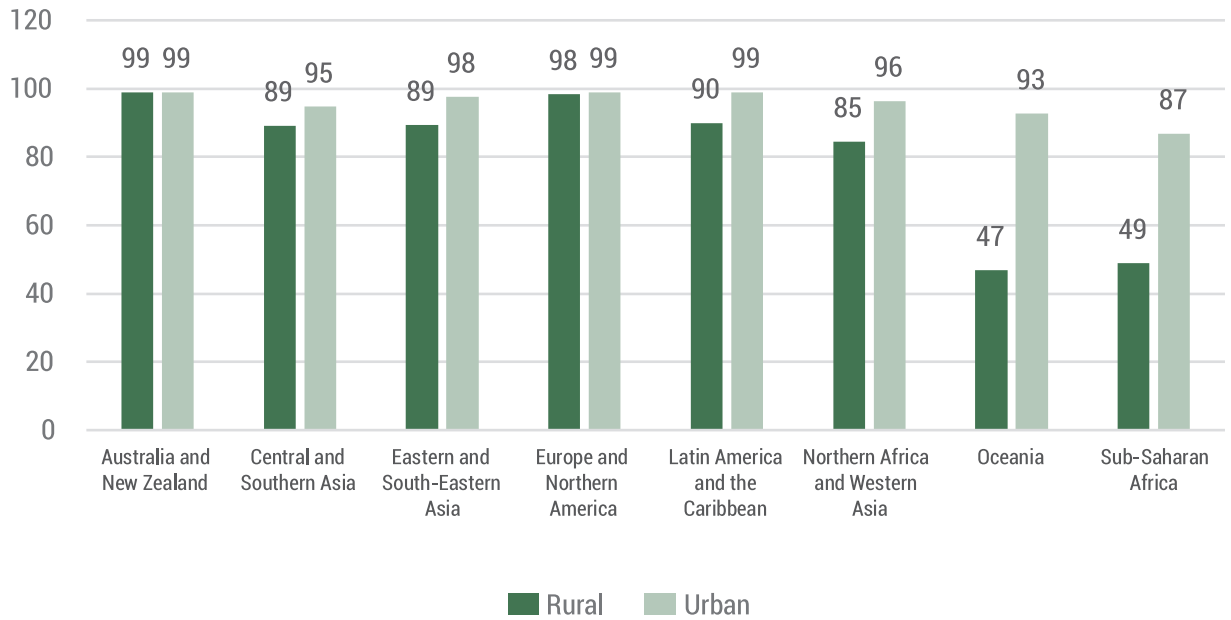
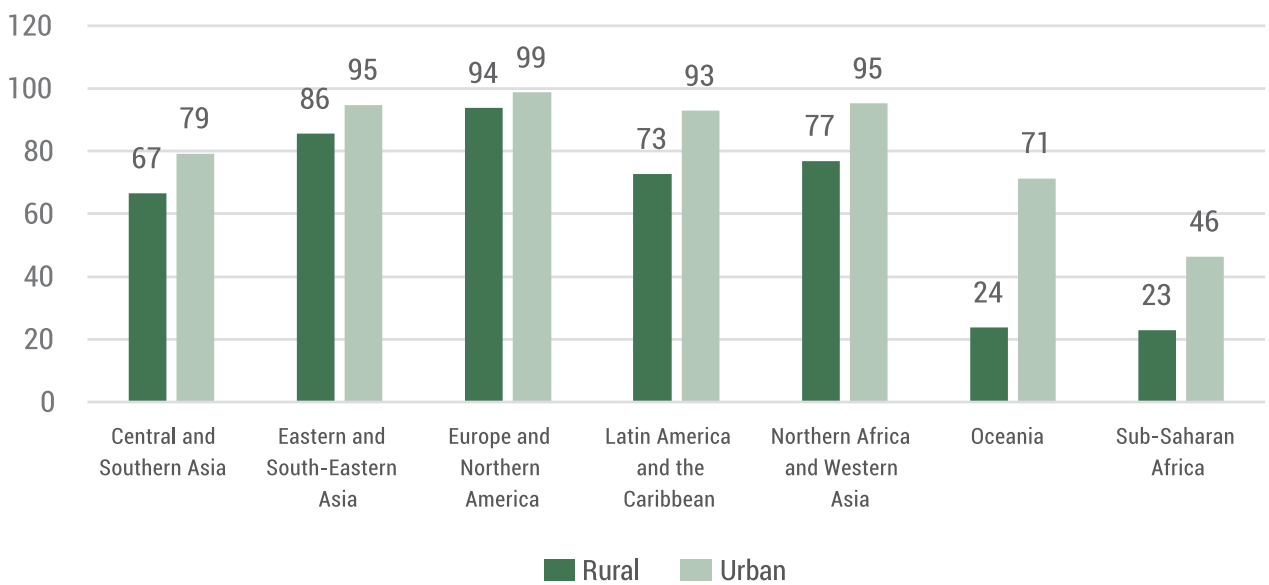


Figure 5.6: Access to basic sanitation facilities



Source: Data Analytics Unit, UN-Habitat.

Urban adaptation also requires a broader range of measures, including the development of prevention measures to tackle vulnerability and develop early warning systems, alongside efforts to contain and mitigate disasters, and measures to facilitate rebuilding and adjustment—for example, through the development of nimble infrastructure networks. Urban adaptation needs to be considered at the planning stage, in new infrastructures, in retrofitting existing infrastructures, and in examining the additional infrastructure needs that climate change generates. A 'capability' approach to urban design seeks to understand actions in the built environment that build resilience while also delivering co-benefits (Table 5.5).

Community-based adaptation (CBA) represents interventions led by communities to build resilience against the impacts of climate change[145]. CBA is especially important in settings where formal institutions overlook the vulnerability of informal settlements and urgent action is required to address issues like flooding and service delivery[146]. CBA helps recognizing local capabilities and can be conducted through various participatory methods, including participatory mapping,[147] vulnerability indices,[148] community engagement in risk communication,[149] and community-based vulnerability assessments.[150]

Urban adaptation needs to be considered at the planning stage, in new infrastructures, in retrofitting existing infrastructures, and in examining the additional infrastructure needs that climate change generates

Participatory design and mapping exercise in Kilifi, Kenya © Julius Mwelu/ UN-Habitat

Table 5.5: Maintaining build environment capabilities for climate change mitigation and adaptation

Built environment capabilities	Climate change mitigation strategies	Climate change adaptation strategies
Health		
Outdoor environmental quality at multiple scales (global to neighbourhood)	Minimize environmental costs (proximate and distal) of all infrastructure	Protect proximate and distal landscapes and built environment from climate change impacts (e.g. heatwaves, droughts, floods, storms etc.)
Indoor environmental quality including air, sound and light quality, physical integrity	Ensure low-carbon building does not compromise indoor environmental quality	Enhance access to spaces of high indoor environmental quality; ensure efforts to enhance indoor environmental quality do not impose stress on outdoor environmental quality
Outdoor thermal adequacy	Seek to reduce outdoor thermal stress imposed through the built environment, including microclimatic characteristics	Protect or enhance mechanisms for low-carbon outdoor thermal comfort
Indoor thermal adequacy	Recognize potential implications of mitigation policy on indoor thermal adequacy	Enhance access to domestic low-carbon thermal comfort control; ensure efforts to enhance indoor thermal comfort do not negatively affect outdoor thermal comfort and/or generate additional greenhouse gas emissions
Physical safety		
Home	Building and operation practices that provide high-quality, low-carbon, affordable housing	Minimize vulnerability of permanent and temporary residential areas to extreme climate events and long-term impacts
Care settings (e.g. care homes and extra-care homes)	Building and operation practices that provide high-quality, low-carbon care provision	Minimize vulnerability of care settings to extreme climate events and long-term impacts
Work/school/public life	Building and operation practices that provide high-quality, low-carbon infrastructure for employment, education and public life	Minimize vulnerability of workplaces, schools and public institutions to extreme climate events and long-term impacts
Accessibility and mobility	Implementing low-carbon, safe and accessible mobility services; reduce non-human-powered mobility needs overall	Ensure low-carbon transportation infrastructure, including human-powered mobility systems, is accessible and functioning through extreme climate events
Cultural vitality		
Public spaces	Building high-quality, low-carbon public spaces (including protecting adequate green space) designed to nurture public and cultural life	Ensure protections and inclusive access for public space in order to meet the diversity of needs this space addresses in the face of extreme climate events and long-term impacts
Sacred sites and cultural amenities	Avoid damaging sacred or culturally significant sites or amenities when developing low-carbon infrastructure; reduce emissions related to sacred sites or cultural activities	Develop meaningful strategies for managing the irreversible loss of sacred or culturally significant sites (including landscapes)
Essential services		
Water and sanitation	Ensure low-carbon, safe and adequate water and sanitation services	Protect and/or redesign water and sanitation services for resilience in the face of extreme climate events and long-term impacts
Food systems	Invest in human and material infrastructure to reduce greenhouse gas emissions of food systems through the entire supply chain	Protect and/or redesign food systems infrastructure (including for subsistence production) for resilience in the face of extreme climate events and long-term impacts
Public health	Ensure adequate low-carbon and accessible public health, including minimizing transportation needs	Ensure public health infrastructure (and access to it) is protected from extreme climate events or long-term impacts

Source: Klinsky and Mavrogianni, 2020.

A key element of adaptation planning is the identification of vulnerable urban populations. Vulnerabilities are often linked to inequalities. Urban populations may see their capability to respond to climate change compromised because of their gender, age, ability, caste, race, sexual orientation and gender conformity. Many of these identities have been observed to have the potential influence aspects of institutional, cultural, and structural environments that affect people's everyday lives. However, each experience must be understood in its own unique way.

The slogan "nothing about us without us"[151] emerges from an Eastern European tradition of political struggles. The slogan has served many groups that are identified as vulnerable to claim their voice in policy processes that purport to respond to their needs. The disability rights movements, for example, use this slogan as a means for people to claim a voice in political debates and demand control over their lives, which may be limited by the dependencies generated by powerlessness, poverty, and institutionalization.[152] An open city that responds to the needs of people with disabilities—and hence everyone—would require the active involvement of those very people.[153]

resilience depends not only on facilitating innovation but also on not adding to existing burdens

The slogan has also been adopted by other groups claiming their right to the city, from waste pickers to sex and gender non-conforming people. With this slogan, different people groups claim urban space and display their capacity to influence their environment and quality of life. Moreover, the slogan is a powerful reminder that resilience depends not only on facilitating innovation but also on not adding to existing burdens. The demands for politically redressing existing injustices in the urban environment call for collaborative processes that build resilience through challenging the drivers of inequality.

Informality shapes the vulnerability of people, and as urban areas continue to grow, the gap between infrastructure available and needs will likely grow. However, perhaps the most significant challenge faced by people living in informal settlements is the recognition of their capacities, and sometimes, even their existence. Yet, their capacities in community-led profiling of their neighbourhoods holds great promise (see Chapter 10). There is a need to understand what just urban adaptation—or, more generally, a just transition—looks like from the perspective of an informal settlement.

Often, relatively cheap and straightforward responses (such as waste collection to reduce flooding, housing designs that facilitate cooling, green public space, transitions to streetlights with solar power, access to clean fuels, and collective maintenance of green spaces, among other measures) may have an enormous impact. Yet, climate finance tends to concentrate on large, prestige-oriented infrastructure projects.

Another challenge which has already highlighted in the previous chapters of this report is the exclusion of the informal economy. Governing institutions tend to exclude it without recognizing the potential supporting role that informal economy opportunities may provide to ensuring an inclusive green growth, one that also supports social groups already suffering discrimination, exclusion and poverty. Notably, past research has shown that only 25 per cent of countries (or 15 of 60 countries) make explicit mention of the informal economy in their national green economy plans.[154]

Lastly, it is important to take cognizance of the paradigm shifts in climate change planning processes. While research on climate change planning initially emphasized local authorities' capacities and institutions, the focus has shifted progressively towards planning as a collaborative and collective project.[155] Multiple actors, such as civil society, the private sector, representatives of professional associations and academia, communities, and citizens, are involved in collaborative planning processes that can deliver adaptation planning (see section 5.5.2 for a discussion of various means of involvement).

5.3.5. Just urban resilience

There are two interpretations of resilience: one is functional and relates to optimizing the process of recovery; the other focuses on the structural challenges and relates to coupling endurance and recovery to demands for justice. Part of the challenge relates not only to the complexity of resilience as a problem to be addressed with current resources but also to the proliferation of climate responses that only entrench and reproduce existing inequalities, and that safeguard some populations at the expense of others:

> *Climate justice means calling out "false" solutions to mitigating climate change that seek to ease the energy transition for the fossil industry and privileged populations. Many of these false solutions involve mining, new infrastructure and exploitative profit and labour schemes that will generate further environmental and climate injustice.*[156]

In that context, delivering resilience is closely linked to our ability to challenge structural drivers of discrimination—be it discrimination resulting from historical legacies of racism, colonialism; discrimination related to sex, gender, age, ability; or other less visible forms of discrimination encountered in everyday life. In that sense, building

resilience requires engaging with the historical processes that have produced vulnerability in contemporary cities. Many of these vulnerabilities are manifest in the spatial configuration of cities, for example:

- The spatial division in urban areas between neighbourhoods that are better serviced than others, with lower-income populations being hosted in areas where access to basic services such as water, mobility, or energy are compromised.[157]

- The creation of areas of privilege safeguarded at the expense of others, for example, in the creation of new enclaves of privilege. In Africa, for example, there is a proliferation of "urban fantasies" in urban projects and masterplans that do not only fail to recognize the realities of urban development in African contexts but also impact negatively on the lives and livelihoods of urban populations, even when those projects are not even constructed.[158]

- The privatization of services and public space, reducing the urban commons for everyone.[159]

- The displacement of people who are prized out of certain neighbourhoods, after the environmental quality of those neighbourhoods raises local prizes in multiple manifestations of gentrification.[160]

- The differentiation of areas with different levels of risks,[161] that often end up accommodating vulnerable populations and new migrants.[162]

- The siting of large infrastructures in areas considered of less value, normally inhabited by less powerful black or indigenous communities—and the creation of sacrifice zones[163] in processes long documented in indigenous struggles and environmental racism that claim for different frames of reference beyond development.[164]

Inclusive greener futures can be secured though active practices of building resilience through community innovation and collaborative planning (see section 5.5) and through the prevention of processes that negate peoples' lives and existence through the implicit privileging of some lives over others—what the philosopher Achille Mbembe has called necropolitics.[165] These are all processes directed through infrastructure and spatial planning and through policymaking, which can be actively prevented in the quest for just urban adaptation (see also section 5.5.1).

5.4. Nature-based Solutions and Environmental Futures

Nature-based solutions (NBSs) are a potential mechanism to manage the impacts of climate change in urban spaces. NBSs are promising in the context of halting biodiversity loss and restoring urban ecosystem services in economically viable ways.[166] The International Union for Conservation of Nature (IUCN) defines NBSs as "actions to protect, sustainably manage, and restore (create) natural or modified ecosystems" that simultaneously address social challenges, providing both human well-being and biodiversity benefits.[167] The European Commission explains that because they are inspired and supported by nature, NBSs are cost-effective and provide environmental, social, and economic benefits.[168]

Bosco Verticale seen from the Biblioteca degli Alberi (BAM), park located between Piazza Gae Aulenti and the Isola district, Milan, Italy © Shutterstock

Table 5.6: Nature as a response to societal challenges

	Definition	Examples
Ecosystem services 	Focus on the benefits that the natural environment and ecosystem provide to humans and societies	▪ Regulating the provision of water, food and services ▪ Facilitating nutrient cycling
Biomimicry 	Biomimicry involves approaches that emulate nature to develop responses to human challenges, for example, in urban design	▪ Fibbers that mimic spiders' silk ▪ Imitation of algae for water purification ▪ Building materials that imitate the structures of mycelium
Ecosystem-based adaptation and mitigation 	Use of ecosystem services to reduce vulnerabilities to climate change impacts and to reduce carbon emissions	▪ Restoration of coastal habitats such as mangroves ▪ Restoration of wetlands and peatlands
Green and blue infrastructure 	The vegetational- and water-related elements that structure the built environment and provide additional services	▪ Involve a range of infrastructures including blue (rivers, canals, ponds, wetlands, floodplains, water treatment facilities) and green (trees, lawns, hedgerows, parks, fields, urban forests)
Ecosystem approaches 	Strategies that focus on the integrated management of land and nature, which consider humans part of the ecosystem	▪ Activities that involve people, value ecosystems, and understand ecological processes

NBSs highlight the importance of biodiversity and ecosystems to address urban challenges such as adapting to climate change, enhancing food security and or facilitating water access. NBSs are aligned with the United Nations 2030 Agenda for Sustainable Development and follow a tradition of designing with nature to respond to human challenges (Table 5.6).[169]

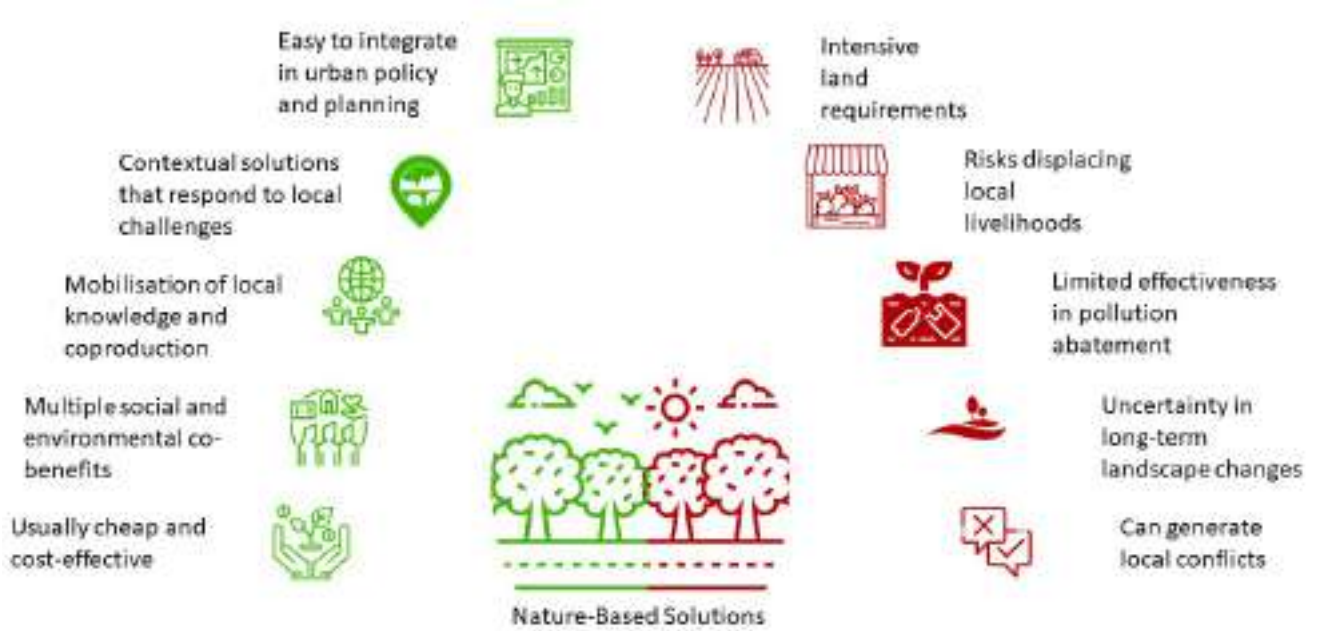
While NBSs offer several benefits, they can also pose some challenges for urban areas. First, NBSs such as greening and artificial wetlands for sewage treatment require significant provision of land and physical space. Land-intensive responses to environmental crises may not be practical or may generate additional challenges, especially when they displace existing land uses. Second, if not guided by a right-based approach, NBSs may displace local economies dependent upon the urban landscape—thereby perpetuating systemic or structural violence. Third, NBSs are not always the most effective means to address certain challenging problems, such as soil and water pollution. Fourth, NBSs may conflict with larger technological or economic development agendas, requiring careful integration into the region's urban planning goals. Lastly, the long-term implications of NBSs, especially in terms of social and ecological change in the places where they are implemented, remain unknown (Figure 5.7).

5.4.1. Biodiversity and ecosystem services enable urban life

Urban blue and green spaces provide multiple ecosystem services that are essential for human wellbeing, for example:[170]

- Providing basic ecosystem services, such as food and water
- Enabling cultural ecosystem services, such as recreational and spiritual benefits
- Supporting regenerative ecosystem services such as nutrient recycling, soil conservation and microclimate regulation

Figure 5.7: Benefits and limitations of nature-based solutions



Both urban sprawl and densification (due to the urban heat island effect) pose challenges to public health, natural systems and ecosystem services.[171] Rapid urbanization has placed additional demands on urban ecosystem services, thus driving a scarcity of material and biological resources. At the same time, ecosystems are functioning at reduced capacity due to pollution and extraction.[172] The pressures of urbanization and increasing population often render urban green and blue infrastructure vulnerable.[173] Urban inequalities manifest in differentiated access to ecosystem services, such as less access to green spaces and a reduced urban tree canopy for lower-income urban dwellers.[174] These inequalities can have deadly ramifications as climate change impacts urban health.

Urban planning policies across the globe continue to focus on built infrastructure and technological improvements with limited consideration of ecosystems and biodiversity.[175] For example, the large-scale conversion of biodiverse areas to farmland or housing impacts negatively on ecosystem services.[176] Moreover, urban planning rarely integrates biodiversity and ecosystem services into service and design, aside from demonstration projects.[177] Even when focusing on these challenges, urban planning tends to focus on symptomatic short-term and incremental treatments to problems that require transformative planning and long-term solutions.[178]

Integrating NBSs in policy and planning further suffers from a lack of clarity in the underlying science and the very complexity inherent in the dynamics of urban social-ecological systems.[179] NBSs may arise through collective motivation in the peripheries of cities that lack access to critical infrastructures for water, sanitation, mobility and energy.[180] However, NBSs are often perceived as inferior to centralized physical infrastructure (such as electricity networks or large waterworks) and are usually overlooked when these regions receive connectivity through more extensive city-based networked infrastructures.[181]

Rural and urban dichotomies persist, despite being challenged on the ground by substantial differences between jurisdictional and administrative boundaries, resource flows and built-up spaces.[182] Some fields of study, such as landscape ecology, have moved beyond these dichotomies to recognize gradients of rurality and urbanity—in other words visualizing landscapes where the rural melds into the urban, forming rural-urban continuums.[183] Such approaches examine peri-urban regions' social and ecological dynamics, especially in developing contexts where centralized infrastructure for critical ecosystem resources such as water and energy provision may often be fragmented, missing or deleterious. However, these approaches are still rare.

5.4.2. Building resilience with NBSs

NBSs support societal development and enhance human well-being in ways that reflect the plural cultural values of urban society while enhancing urban resilience and the capacity of cities to provide essential ecosystem services.[184] Indeed in many urban areas, NBSs have been associated with positive effects on urban biodiversity and human health.

Studies in cities in the US and India have demonstrated that daytime air temperature is significantly reduced in urban areas with a greater tree canopy cover, especially on the hottest days of the year and times of the day.[185] Globally it has been shown that green spaces within cities (such as parks or other tree lined areas) are on an average 0.94°C cooler than build up areas without greenery.[186]

NBSs involving the establishment of wetlands and green urban spaces in Italy have reduced urban flood risk with a reported 10 per cent greater reduction in downstream flood events and a 7.5 per cent reduction in peak flow when compared with non-NBS-based infrastructural interventions.[187] The success of NBSs for flood control in São Paulo (Brazil) have encouraged municipal authorities to include them in the city's Climate Action Plan in the context of stormwater management.[188] Rewilding of parts of Slovenia's Mediterranean coastline has improved soil quality, thus positively impacting the region's ability to sequester carbon and store water, as well as its overall biodiversity capacity.[189] An NBS approach adopted within Copenhagen after a 2011 flooding event was highly effective in reducing urban flood risk, though the implementation of NBSs in the city has since been highly contested.[190]

Real estate values often increase dramatically as properties get closer to urban green and blue spaces.[191] The effect of this increases may be mixed, as nature-based projects may also drive processes of urban gentrification that intensify inequalities.[192] NBSs may provide local employment and business opportunities with beneficial outcomes for society, environment and public health.[193] A recent study shows that ecosystem restoration creates 3.7 times as many jobs as oil and gas production per dollar (Box 5.5).[194]

Box 5.5: Job comparison between green and unsustainable investment types

Building efficiency creates **2.8 times** as many jobs as fossil fuels per US$1 million
Industrial efficiency creates **1.8 times** as many jobs as fossil fuels per US$1 million
Geothermal energy creates **1.7 times** as many jobs as fossil fuels per US$1 million
Solar photovoltaic energy creates **1.5 times** as many jobs as fossil fuels per US$1 million
Upgrades to existing grids create **1.5 times** as many jobs as fossil fuels per US$1 million
Wind energy creates **1.2 times** as many jobs as fossil fuels per US$1 million
Hydropower creates **1.2 times** as many jobs as fossil fuels per US$1 million

Pedestrian-only infrastructure creates **1.3 times** as many jobs as road construction per US$1 million
Bicycle-only infrastructure creates **1.4 times** as many jobs as road construction per US$1 million
Mass transit creates **1.4 times** as many jobs as road construction per US$1 million
Railways creates **0.8 times** as many jobs as road construction per US$1 million

Electric vehicle manufacturing creates **0.9 times** as many jobs as internal combustion engine vehicles per US$1 million
Battery cell manufacturing creates **1.2 times** as many jobs as internal combustion engine vehicles per US$1 million
Electric vehicle charging infrastructure creates **2.0 times** as many jobs as internal combustion engine vehicles per US$1 million

Ecosystem restoration creates **3.7 times** as many jobs as oil and gas production per US$1 million

Source: World Resources Institute et al, 2021.

NBSs, therefore, present an approach to developing sustainable solutions that focus on human well-being, while at the same time being responsive to long-term environmental changes and associated hazards.[195] Often, they provide economically viable and inclusive responses.[196] They can be integrated in planning processes that not only value nature beyond benefits and services to humans, but also incorporate diverse perspectives relating to nature and community that emerge within plural cultural contexts.[197] UN-Habitat and UNEP, with the support of European Union, is currently implementing the Go Blue Project across six counties in Kenya's coastal region (Kilifi, Kwale, Lamu, Mombasa, Taita Taveta and Tana River). The project aims to unlock opportunities in urban centres in these counties for sustained and inclusive economic growth, while mainstreaming conservation and sustainable use of the coastal and marine environment.[198]

5.4.3. NBSs for sustainable urban futures

Ecological considerations should be an integral part of urban planning processes. Integrating NBSs in urban planning and policy requires appropriate capacities to respond to the fundamental changes that societies face while keeping nature at the centre of planning processes and frameworks. The city of Manizales, Colombia, for instance, is mainstreaming biodiversity solutions into its planning policy and legal frameworks, supported by UN-Habitat and University of Michigan.[199]

NBSs can also be integrated into the circular economy to restore existing relations with nature in urban environments and incorporate nature into sustainable business models.[200] "Bioconnections" are strategies that promote reconnections between society and nature with efforts aimed at stewarding, regenerating and maintaining biodiversity and ecosystem services to support the circular economy.[201] Examples of bioconnections include traditional methods like reforestation for carbon sequestration and experimental methods like using microalgae photobioreactors to extract nutrients from wastewater, produce oil, generate biomass and electricity.[202]

The use of engineered wood or bamboo from reforested sources could create carbon sinks in urban spaces as it has been shown that materials such as bamboo can remove five to six times more carbon from the atmosphere in comparison to conventional timber-based construction material,[203] although globally, the extent to which construction materials can remove carbon emissions also depends on how forests are managed.[204]

Restoration and protection of biodiversity through greenbelts, regenerative farming, permaculture and pollinator gardens are important components of NBSs for urban planning.[205] NBSs to regulate ecosystem services include the use of compost from organic waste in urban agriculture to promote nutrient recycling, nitrogen and phosphorus recovery through cultivated wetlands that recycle wastewater, and nutrient loss reduction through stormwater drainage and rooftop gardening.[206]

NBSs can also be integrated into large infrastructural projects. For example, water-efficient cityscapes promote flood control through green infrastructure, thus reducing surface runoff, increasing groundwater retention and filtering pollutants.[207] Guidelines for integrating NBSs into urban planning must consider the sustainable sourcing of raw material required for NBSs, further involving measures for resource traceability and exchanging industrial infrastructure and other by-products.[208]

Participatory governance can support the creation of social networks to support, develop and maintain NBSs.[209] NBS-based design can support the co-creation of specially designed and equitable spaces for different social groups, addressing questions of age, ability, gender, sexual orientation, or race. A study in Berlin showed that supportive social networks facilitate the access of elderly people to green spaces.[210] Cities may have a certain potential to buffer the impacts of change, enhance human well-being and contribute to global sustainability and resilience.[211] However, these strategies require an understanding of the social, ecological and economic peculiarities of urban spaces in order to assess the suitability of proposed NBSs, beyond standalone interventions.[212] In sum, NBSs must be part of inclusive planning processes for sustainable urban futures.

5.5. Inclusive Planning Processes

Envisioning and realizing a greener urban future require inclusive planning processes. Addressing existing vulnerabilities and inequalities[213] and delivering just and transformative outcomes necessitates the involvement of diverse perspectives.[214] This section focuses on, first, identifying existing inequalities and injustices in urban environmental decision-making and, second, proposes a set of approaches to include diverse perspectives in environmental decision-making. A recent joint publication by UNEP and UN-Habitat highlights the importance of seeking equity and justice across all local environmental action and

programming—emphasizing that these considerations should not be addressed as an afterthought. The report further calls for "ensuring that those most affected by unsustainable 'business as usual' approaches are heard, that their needs are taken into consideration, but also, and crucially, that their knowledge of urban dynamics, and their capacity to partner in solution finding and city-making, are taken seriously."[215]

5.5.1. Inequalities and injustice in urban environmental decision-making

Planning for greener urban futures requires foregrounding the experiences of vulnerable groups. Yet, many disadvantaged groups lack access to the social and political processes and institutions where environmental decision-making takes place. Decision-making processes must prioritize the needs of disadvantaged populations because an urban environment that serves the needs of vulnerable people is also an urban environment that serves the needs of everyone.

However, urban decision-making processes often exclude the urban poor, who tend to have fewer resources, time and connections than established stakeholders and urban elites, even when those processes are designed to be participatory.[216] Likewise, women are often excluded from the urban planning process, partly because of gender norms concerning formal and informal political leadership and weaker representation in formal economies.[217] Migrant workers are also routinely excluded from decision-making processes, despite their exposure to socio-environmental risks.[218] Other forms of political exclusion include discrimination based on race,[219] ability,[220] sexuality[221] and socio-political background (e.g. marginalization of refugees).[222] All strategies for inclusion require careful consideration of how exclusion has shaped experiences of citizenship and belonging and how to facilitate political recognition, for example, through dialogue, the establishment of mutual respect and different forms of reparation.[223]

Sometimes environmental policies and programmes in cities lead to the entrenchment of existing inequalities and vulnerabilities is a rights-based approach is not applied. For example, investment in green urban spaces can cause negative impacts on lower-income and marginalized communities by increasing property prices and contributing to gentrification processes.[224] Infrastructure investment to build urban resilience can concentrate wealth in enclaves for the benefit of urban elites.[225] Investment on adaptation projects in cities can also lead to evictions and displacement of the urban poor and slum dwellers, resettlement on land exposed to risks, and disruption of informal livelihoods.[226] These insights align with a long-standing understanding of how urban development visions, especially formal economic and spatial plans developed through top-down and expert-led processes, often are poorly aligned with the needs of low-income groups and even directly detrimental to their lives.[227] The impacts of environmental policy on the most disadvantaged must be central to planning for green urban futures.

Sometimes environmental policies and programmes in cities lead to the entrenchment of existing inequalities and vulnerabilities is a rights-based approach is not applied

Epistemic injustice occurs in urban planning when groups and individuals in positions of formal and informal authority downplay and invalidate multiple forms of knowing and living in the world.[228] The concept is closely tied to histories of colonization, as the occupation of lands and peoples also involved the subordination of their cosmologies and worldviews.[229] In the context of environmental decision-making in cities, the legacies of such domination manifest through hierarchies of knowledge, in which some forms of knowing are consistently valued above others.

The marginalization of indigenous knowledge is one form of epistemic injustice in urban planning. On the one hand, there is growing recognition that indigenous knowledge can play a key role in building green cities by contributing to climate-responsive designs.[230] Some indigenous communities are highly vulnerable to climate change impacts, particularly those who live with and depend on local ecosystems.[231] For instance, Indigenous knowledge of weather patterns can improve early warning systems to reduce flooding.[232] Participatory mapping, or other knowledge exchange methods, can incorporate indigenous knowledge in urban risk assessments.[233]

Incorporating indigenous knowledge into environmental decision-making in cities is not straightforward. Indigenous knowledge is frequently not recognized[234] or reduced to narrowly defined policy domains (e.g. cultural heritage).[235] There is a risk that indigenous knowledge is appropriated when integrated into dominant knowledge systems without consent, through subordination within dominant knowledge systems, especially when disconnected from indigenous values.[236] Addressing epistemic injustice is not only a question of the revaluation of indigenous knowledge systems. It is also a question of recognizing the occupation of indigenous

lands and locating claims to sovereignty, autonomy and land ownership at the heart of urban planning.[237]

Addressing epistemic injustice also relates to building recognition for local and traditional forms of knowledge. In Finland, local knowledge has contributed to protecting ecosystems in urban planning processes, especially in preserving nature of importance to residents.[238] Traditional knowledge has played a role in biodiversity preservation in communities in northeastern India, for instance, by maintaining community gardens.[239] In Bucharest, Romania, a participatory process compiled residents' experiences and needs to develop bicycle infrastructure aligned with local preferences.[240]

Taken together, indigenous knowledge, local knowledge and traditional knowledge provide alternatives to expert-led, technical-scientific planning, more recently captured by the concept of "subaltern knowledge."[241] Subaltern knowledge consists of situated, place-based forms of knowing excluded from dominant knowledge production and planning processes. Subaltern knowledge can play a crucial role in environmental planning, for example, urban climate adaptation, especially in producing socially just and responsive plans to the needs of diverse communities.[242]

Box 5.6: Post-COVID-19 resilience in informal settlements

A partnership between Cities Alliance and Shack/Slum Dwellers International (SDI) established to support informal communities to build resilience in the context of the COVID-19 pandemic provides insights on how to align recovery programmes with the priorities of the urban poor. First, the provision of sanitation is essential in communities that lack access to basic washing facilities. Projects that provide such services can play a role in aligning measures to prevent virus transmission with ensuring long-term access. Second, by strengthening safety nets, communities can reduce vulnerability to multiple kinds of shocks. For example, savings groups can address collective concerns with pooled resources. Third, communities can play a leading role in collecting data and raising awareness. Thus, they can draw attention to urgent needs, formulate collective priorities, build channels of communication and negotiate capacity vis-à-vis government authorities or donors.

Source: SDI, 2021.

Urban initiatives to address epistemic injustice support the revaluation of identities and perspectives and the creation of rights for socially or politically excluded people (e.g. based on age, ethnicity, race, migratory status, sexuality, or gender).[243] One relatively well-known example is the lack of recognition of waste pickers,[244] of which organizations like WIEGO work with such communities to build legitimacy and respect for their work.[245]

Gender-responsive planning includes strategies to address gendered power relations and make women's perspectives central to urban planning.[246] For example, projects to rediscover and preserve cultural heritage help revalue histories and cultural identities that have been marginalized in a city. Cultural heritage protection can easily be co-opted by global narratives not aligned with local concerns[247] or even reinforce inequalities and oppression.[248] Methods of "counter-mapping" and artistic production can provide alternative means to redefine the feminist city.[249]

5.5.2. Processes that include diverse perspectives in environmental decision-making

A green, sustainable urban future requires delivering environmental benefits across urban areas to reach every segment of the urban population, especially those who are most disadvantaged. Prioritizing the needs of the most vulnerable means creating opportunities within local planning processes to represent their views, a requirement already reflected in the 2030 Agenda for Sustainable Development. Planning needs to be approached as a collaborative process capable of bringing together diverse views and perspectives.[250] A variety of formal organizational arrangements enable public participation in urban decision-making (Table 5.7). Many of these tools are regularly used to incorporate participatory designs into urban planning processes.

The popularization of mobile applications has increased the use of participatory tools in urban planning, including as a means to collect environmental information, create local networks and facilitate public dialogues.[251] Some models of public involvement and participation are also available in electronic formats, which in some contexts may increase opportunities for access. In China, for instance, such technologies have unleashed a stronger public voice on environmental governance and sustainability issues relating to urban areas.[252] However, such advantages are context-dependent and online communication may be most effective in combination with face-to-face interaction.[253]

Table 5.7: Institutions and methods that facilitate participation in urban planning and management

Method	Definition and benefits	Examples
Citizen assemblies	Decision-making bodies composed of lay citizens tasked with providing a recommendation on specific policy issues. Citizen assemblies are used in urban planning to engage ordinary residents and create deliberation.	The Grandview-Woodland Citizens' Assembly in Vancouver, Canada, involved citizens in a broad range of urban planning decisions showing that an assembly can be a cost-effective way to realize citizen participation. A citizen food assembly organized in York, UK, functioned as a platform for debate and drew attention to food insecurity.
Citizen panels or citizen juries	Created by a random selection of citizens to provide feedback on policy options or, in the case of juries, provided with information and expert input to make a recommendation on a policy issue	In Spain, citizen juries have increased citizen engagement in social problems; however, they represent limited participation in decision-making systems overall, and their impact on policy may be limited.
Community councils	Decision-making body through which residents can influence neighbourhood decisions. They exist in multiple forms (neighbourhood associations, community enterprises, religious congregations), which may be grassroots-led or supported by local authorities. Community councils can provide access to political processes for low-income groups, but in operating outside of formal democratic institutions, they may also be co-opted by dominant local interests.	In East Jerusalem, community groups perform many social functions, including service provision (e.g. education and culture), community organization, and political representation.
Participatory budgeting	An approach to involve citizens in budget allocation that aims to increase citizen involvement, enhance the accountability of decisions related to local finance, and align planning processes with local needs. It can be used in relation to urban environmental planning.	Experiences from Porto Alegre and Belo Horizonte, Brazil, suggest that participatory budgeting can increase access of previously excluded groups to decision-making, even though the poorest citizens remain excluded. In Porto Alegre, participatory budgeting may have brought environmental benefits by channelling financial resources towards sanitation and wastewater management, public transport, waste collection and green space. Participatory budgeting in Polish cities functioned as a source of creativity and innovation, with potential benefits for environmental management. Participatory budgeting processes in Medellín, Colombia, empowered women, including through enhanced leadership skills and awareness of the political system. In cities in the US, participatory budgeting has played a role in providing access to "traditionally marginalized residents," including "non-citizens, seniors, people of colour, and youth" (at the same time, the time-consuming character of these processes is identified as a drawback).
Participatory planning	Participatory elements are central to broader urban planning processes, such as master plans or zoning regulations. Participatory planning is also a strategy to address urgent issues in deprived neighbourhoods or informal settlements.	Experiences from São Paulo have shown that participation in master planning and zoning is one way for groups to articulate priorities in planning processes. However, such participation favoured affluent citizens, and they are not guaranteed to deliver socially just outcomes. In Kenya, participatory planning in informal settlements has been used to advance upgrading schemes and identify residents' priorities. However, in Egypt, participatory exercises in informal settlements have struggled to address underlying drivers of marginalization, such as land ownership and tenure, housing markets, and financing structures.
Consultative processes	In urban planning, consultations can take a range of formats, such as surveys, focus groups, public meetings, or citizen dialogues. These processes can be implemented with varying numbers of participants, in comprehensive urban planning processes or sector-specific issues, and city-wide processes or neighbourhoods.	Participatory methods in Malaysia's urban planning processes include public hearings, citizen forums, community or neighbourhood meetings, citizen surveys, focus groups, and online public outreach. Some methods are more effective in reaching larger numbers of citizens (e.g. citizen surveys). In contrast, other methods may be less representative but more effective in terms of generating deliberation to address complex questions (e.g. public hearings or focus groups).

Note: Participatory mechanisms extend the definition of citizenship to everyone in a city regardless of their citizenship status, to avoid excluding vital participants such as migrants and refugees

Source: Lacelle-Webster and Warren, 2021; Beauvais, 2018; Doherty et al, 2020; Font and Blanco, 2007; Avn et al, 2021; Souza, 2001; Calisto Friant, 2019; Bernaciak et al, 2017; Park et al, 2018; Hajdarowicz, 2018; Gilman, 2016; Nasca et al, 2019; Caldeira and Holston, 2015; Majale, 2008; Khalifa, 2015; Ismail and Said, 2015.

Box 5.7. Participatory approaches to future visioning and scenario planning

There is a growing interest in participatory visioning, forecasting and scenario planning methods, including approaches that build on arts and creative exercises. This interest emerges from the need to radically rethink cities and urban futures to respond to social and ecological crises.

Participatory scenario planning represents one approach to reimagine urban futures collectively. A scenario is "a coherent, internally consistent, and plausible description of a potential future trajectory of a system."[254] Scenario planning assumes that the future is uncertain; therefore, planning must consider multiple development trajectories with differential impacts on diverse social groups.[255] Scenario planning combines quantitative methods (modelling, forecasting, analyses of large datasets) with qualitative strategies to draw on experiential knowledge and imagine different futures.[256] The technique is used in relation to natural resource management (e.g. forests, wetlands, coral reefs), but also in the context of urban planning to address complex, long-term socio-ecological issues, incorporate multiple knowledges and build shared understandings (examples of applications in urban or peri-urban planning include cases in Germany, Kenya, South Africa, and the US).[257]

While the technical skills involved in forecasting and modelling can significantly influence professional stakeholders, the objective is to engage diverse publics and interests.[258] Public participation sessions, community workshops, and groups discussions are often used throughout the process to ensure that various preferences are embedded in all stages of scenarios planning, employing tools such as drawing, mental models, maps and creating storylines.[259] A key outcome can be to create dialogue about the assumptions and normative principles that underpin data-heavy modelling and projections. The exercise invites dialogue and reflection among stakeholders with different concerns and ideological entry points (e.g. scientists and activists).[260]

At the same time, achieving participation that is both deep (in-depth involvement in scenario creation) and wide (participation of a large, representative segment of an urban population) is often challenging.[261] A comparative analysis of 23 participatory scenario planning processes showed that the average number of participants was around 50 (rarely above 90), there was a lack of diversity of participants, uneven power relations prevented participation on an equal basis, and the impact on policy-making was unclear (monitoring and evaluation were often missing).[262]

There is also a new toolbox of collective visualization approaches available in urban planning, for example, through maps,[263] gaming[264] or public participation GIS tools (for public involvement in spatial planning).[265] However, it is not clear whether such collective visioning exercises necessarily lead to just and green cities. Creative engagement methods encounter similar forms of challenges with participation as conventional participatory tools. They may, for example, focus on narrowly defined goals or preclude in-depth engagement with the lives of urban residents.[266]

5.5.3. Foregrounding collaborative forms of urban governance

Collaborative modes of urban governance are today commonplace in cities around the world. Co-production represents approaches to reimagine urban decision-making from shared ownership in service delivery and joint knowledge production in planning. In the context of service delivery, co-production reflects the logic that municipal services are more effective and just when both public actors and citizen groups are involved.[267] For example, in the delivery of water services in Lilongwe, Malawi, the co-production of services by a public utility and civil society groups addressed inefficiencies in delivery by the state and built social capital among communities.[268]

Co-production responds to the complexity of socio-environmental challenges, which always involve multiple problem frames and possible solutions. Co-production is one way to bring together stakeholders, forms of knowledge, and perspectives in response to this complexity.[269] Also, it represents an opportunity for social movements to shape the terms and conditions of planning.[270] Co-production as a form of joint knowledge production in decision-making can deliver various outcomes, such as local capacity building, drawing attention to environmental injustice and

increasing public communication and transparency.[271] An example of co-production in urban environmental planning is the formulation of the Barcelona climate plan, where co-production opened up the use of new digital platforms to involve citizens, but also raised practical challenges (e.g. with regards to the timing of citizen input, unequal knowledge of participants, and confusion about the meaning of co-production).[272]

Partnership-based approaches bring different social groups (authorities on multiple government levels, businesses, NGOs, community associations) into urban governance. Urban partnerships exist in a range of organizational forms, including more or less formal arrangements, such as contractual arrangements between public and private actors for infrastructure and service delivery (i.e., public-private partnerships, policy coalitions, advisory boards and panels, jointly managed programmes and international networks.[273] Partnerships represent a governance strategy that draws on the strengths of different social groups, including capacities for innovation and investment of the private sector and abilities of community engagement and responsiveness of social issues of civil society.

Urban decision-making can also operate through different forms of synergies with activist movements. The inclusion of multiple perspectives in environmental decision-making occurs through collaboration and contestation and conflict, even agonism and strife.[274] Activist groups play a crucial role in urban environmental politics, including introducing new issues into decision-making agendas, drawing attention to existing forms of injustice, and participating in neighbourhood projects— as long illustrated by environmental justice movements.[275] The recent wave of global youth protests in climate politics such as Fridays for Future, Extinction Rebellion and the Sunrise Movement highlights the importance of demonstrations in environmental politics.

The engagement of grassroots organizations, community groups and international environmental movements played a crucial role in adopting declarations of climate emergency by local authorities around the world.[276] The rising awareness of the complex interconnections between multiple forms of social and environmental injustice, such as the links between racism, environmental justice and state violence,[277] creates a renewed sense of urgency for activist groups and social movements in urban environmental decision-making processes.

5.6. Building Global Urban Partnerships

The events of the last two years, raising concerns about climate change and the need to deal with the COVID-19 pandemic, have highlighted the need for a global partnership for sustainable development. This is a moment like no other to facilitate cooperation and global solidarities.[278] Building partnerships requires an enabling environment capable of sustaining long-term initiatives that recognize every actor, from youth activists to private-sector corporations, as part of the solution.[279]

Climate politics is dominated by multilateralism, as the UNFCCC orchestrate efforts via voluntary agreements and nationally determined contributions.[280] However, the impact of these efforts requires examining action on the ground and gaps between voluntary commitments and emission reductions needed to achieve the goals of the Paris Agreement persist.[281] Subnational actors not only can provide additional emission reductions to bridge this gap[282] but also can influence global partnerships and advancing global development agendas. [283]

Transnational municipal networks (TMNs) facilitate the cooperation on climate change between local governments and other subnational institutions, including regions, and non-state actors that can stir up climate action at the local level.[284] These networks have harnessed cities capacities to create a new scene of global environmental governance. [285] City networks cast local governments as mediators between global concerns and place-based solutions.[286]

TNMs are most often voluntary and non-hierarchical organizations.[287] While there is a variety of models of TMNs, multinational membership is a shared characteristic.[288] Membership of transnational municipal networks is more common in Europe and North America, but many have global reach.[289] TMNs support cities to create and implement policy and planning, practices and voluntary standards that support emission reductions and address vulnerabilities.[290] Gaining influence in international arenas is a key motivation for cities to join TNMs.[291]

City networks cast local governments as mediators between global concerns and place-based solutions

Box 5.8: Transnational municipal networks in global environmental governance

The International Council for Local Environmental Initiatives (ICLEI) is a pioneering TMN. It was created after hundreds of local governments gathered at the Congress of Local Governments to a Sustainable Future organized by the United Nations Environmental Programme (UNEP) in New York, in 1989 with 200 local governments from 43 countries. In its inception, ICLEI's main objective was to support local governments to transform effectively towards a greener economy.[292]

With currently over 1,750 local and regional governments in more than 100 countries, the organization helped cities embark on a pathway towards low-emission, nature-based, resilient and circular development. ICLEI's first programs emphasized participatory governance and sustainable local development planning. The Cities for Climate Protection (CCP) campaign, promoted by ICLEI, was the first to support cities in planning climate action to reduce greenhouse gas (GHG) emissions, improve air quality and increase sustainability and habitability. Over the past decade, UN-Habitat and ICLEI have supported local governments as they develop comprehensive urban low-emission development strategies (Urban-LEDS) and climate action plans.

Another bottom up TNM is the C40 Cities Climate Leadership Group (C40), formed in 2005 when the London Mayor Ken Livingstone brought together representatives of 18 megacities to cooperate to reduce greenhouse gas emissions. The group has grown currently including near 100 megacities in every region. C40 has increasingly focused on establishing concrete, measurable goals but its members are also increasingly concerned about the potential of coupling emission reductions with ancillary benefits for resilience and prosperity.

The European Union's Covenant of Mayors for Climate and Energy (EU CoM) was launched in 2008 with the European Commission's support.[293] As of January 2021, EU CoM has more than 10,600 signatories, mainly from the EU, as well as nearby countries like Morocco and Turkey. The Covenant of Mayors also appears as a key actor in the Urban Agenda for the EU, launched with the Pact of Amsterdam. Other top-down networks have emerged from the cooperation between multiple organizations at different levels. For example, in 2014, the United Nations Secretary-General Ban Ki-Moon and its Special Envoy on Cities and Climate Change, Michael R. Bloomberg, in cooperation with C40 and ICLEI, launched the Compact of Mayors. The Global Covenant of Mayors for Climate and Energy (GCoM) emerged with the combination of efforts in the Compact of Mayors and the EU Covenant of Mayors in 2016, becoming the largest initiative of this kind, with more than 10,500 cities and local governments from 138 countries as of 2021.

Source: Castán Broto et al, 2022; Urban LEDs Project (https://urban-leds.org/)

5.7. Concluding Remarks and Lessons for Policy

This chapter engages with the potential to deliver green urban futures. It highlights some aspects of the current state of climate action:

- First, delivering green urban futures is a massive challenge of global proportions, and so far, our collective impact on global average temperatures has been limited. A more significant effort is needed to turn around the unsustainable pathways that contemporary cities and urban areas follow.

- Second, there is mounting evidence about future scenarios' development and how future thinking can inform urban planning. A key lesson is that scenario planning requires input from multiple actors and that forecasting techniques alone are not sufficient to deliver an urban transition to sustainability.

- Third, in the post-pandemic context, there are increasing fears that we are losing the window of opportunity to catalyze a green urban transition through the deployment of recovery funds.

- Four, inclusive planning processes must recognize multiple forms of knowledge valuable to planning and recognize the need to deliver equity and justice. In the case of informal settlement dwellers and impoverished populations, this means recognizing all urban dwellers not as passive victims of an urbanization process but

as active makers of urban futures that must be given a range of arenas to make their voice heard.

The following policy lessons may contribute to sustainable urban futures:

- Invest in participatory methods for scenario planning and combine participatory planning techniques with forecasting techniques.
- Prioritize inclusion and the needs of the most vulnerable in the delivery of green urban futures.
- Prepare to learn from both transnational experiences of climate and biodiversity action and place-based initiatives.
- Build capacities to enable change at scale.
- Experiences in energy management, transport, risk management and nature-based solutions demonstrate the potential of people-oriented forms of planning.

Endnotes

1. IPCC, 2021.
2. IPCC, 2018.
3. The Climate Group, 2022.
4. IPBES, 2019.
5. IPCC, 2018.
6. Ramaswami et al, 2021.
7. Chavez and Ramaswami, 2013; Ramaswamiet al, 2017.
8. Ramaswami et al, 2021.
9. Hausfather, 2021.
10. Dyke et al, 2021.
11. Lewis, 2021; Dyke et al, 2021
12. Smith et al, 2016: Dyke et al, 2021; Leung et al, 2014
13. Bailey, 2007a; Bailey, 2007b; Lohmann, 2001; Lohmann, 2008.
14. Hausfather, 2021.
15. Hughes and Strachan, 2010.
16. Forster et al, 2020.
17. Bataille, 2020.
18. Bataille et al, 2020.
19. Pye et al, 2017.
20. Bataille, 2020.
21. Habert et al, 2020.
22. Goodess et al, 2021.
23. Karunathilake et al, 2018.
24. Karunathilake et al, 2020.
25. Bakhtavar et al, 2020.
26. Carlson et al, 2022.
27. Hughes and Strachan, 2010.
28. Forster et al, 2020.
29. Bradfield et al, 2005.
30. Hughes and Strachan, 2010.
31. Tyszczuk and Smith, 2018; Hughes and Strachan, 2010; Geels, 2005.
32. Fortes et al, 2015; Foxon, 2013; Geels et al, 2016; Turnheim et al, 2015.
33. Hughes and Strachan, 2010.
34. Geels et al, 2020.
35. Hofman et al, 2004.
36. Hulme, 2011; O'Brien, 2016.
37. Tyszczuk and Smith, 2018.
38. IEA, 2021b.
39. IEA, 2021b.
40. Carrington, 2022.
41. Boyle et al, 2021.
42. Boyle et al, 2021.
43. Abdullah, 2021.
44. Gronkiewicz-Waltz, 2020.
45. UNFCCC, 2021a.
46. IEA, 2021b.
47. Seto et al, 2021.
48. Chester et al, 2014; ICLEI, 2018.
49. Coalition for Urban Transitions, 2019.
50. Hsu et al, 2020.
51. UN-Habitat, 2021a.
52. Coalition for Urban Transitions, 2019.
53. United Nations, 2021c.
54. European Commission, 2018.
55. de Coninck et al, 2018.
56. Gago et al, 2015; IEA, 2014.
57. Asaee et al, 2018.
58. Nematchoua et al, 2021.
59. Becchio et al, 2018.
60. Marique and Reiter, 2014; Marique et al, 2013.
61. Nematchoua et al, 2021.
62. You, 2021.
63. Harris,
64. Abdullah, 2021.
65. Andrijevic et al, 2020.
66. Eyre et al, 2018.
67. Creutzig et al, 2018.
68. Edenhofer, 2015; Riahi et al, 2015.
69. Geels et al, 2016.
70. Markard, 2018.
71. Köhler et al, 2019.
72. IEA, 2021a; IEA, 2021b.
73. IEA, 2021b.
74. Schot et al, 2016.
75. Köhler et al, 2019.
76. Allan and Hadden, 2017.
77. Moberg et al, 2019; Marteau et al, 2021; Higham et al, 2016.
78. Chen et al, 2019; Marteau et al, 2021; Capstick et al, 2014.
79. IEA, 2021c.
80. IEA, 2021d.
81. C40 Knowledge Hub, 2021.
82. Levy, 2013.
83. IPCC, 2014a.
84. WHO, n.d.
85. WHO, n.d.
86. WHO, 2018a.
87. Nieuwenhuijsen et al, 2017.
88. Forouzanfar et al, 2016
89. Road traffic mortality, The Global Health Observatory data portal (https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/road-traffic-mortality)
90. Maantay, 2007.
91. McArthur et al, 2019.
92. Walker et al, 2010.
93. Flyvbjerg et al, 2006.
94. Lyons and Davidson, 2016.
95. Schuckmann et al, 2012.
96. Ravetz et al, 2021.
97. Nieuwenhuijsen et al, 2017.
98. Ravetz et al, 2021.
99. Ravetz et al, 2021.
100. Bartholomew, 2007.
101. Broom, 2021.
102. Busch, 2017; Cunningham, 2017.
103. McKinsey & Company, 2020; Heineke et al, 2019.
104. Levy, 2013.
105. Lyons and Davidson, 2016.
106. Imrie, 2000; Sheller, 2018.
107. Zhen, 2021.
108. UN Women, 2019.
109. UN Women, 2019.
110. Evans et al, 2018.
111. UITP, 2021
112. Cervero and Golub, 2007.
113. Surico, 2021.
114. Kumar et al, 2021.
115. Revi et al, 2014.
116. IPCC, 2018.
117. IPCC, 2021.
118. Global Commission on Adaptation, 2019.
119. Meehan et al, 2020; UNESCO, 2019; Kjellstrom et al, 2007.
120. Kjellstrom et al, 2006; Ganzleben and Kazmierczak, 2020.
121. Sovacool, 2019, Bryant and Mohai, 2019.
122. Kubanza and Simatele, 2016, Gutberlet et al, 2017.
123. Smith et al, 2004.
124. Roe et al, 2016.
125. Singh et al, 2015.
126. Richmond et al, 2018; Dodman et al, 2019; Hlahla and Hill, 2018; Gran Castro and Ramos De Robles, 2019.
127. Grasham et al, 2019; Adams et al, 2020.
128. Abu and Codjoe, 2018.
129. Gupta et al, 2017.
130. Kher et al, 2015.
131. Sanchez-Guevara et al, 2019s
132. Mitchell and Chakraborty, 2014.
133. Creaet al, 2017.
134. Zhong et al, 2017; Østby, 2016; Adger et al, 2021
135. Hughes, 2015.
136. IPCC, 2018.
137. Susskind, 2010.
138. McFarlane, 2020.
139. Angel et al, 2021.
140. Guzman and Bocarejo, 2017.
141. Unnikrishnan and Nagendra, 2021.
142. Global Commission on Adaptation, 2019; "..upgrading living conditions in vulnerable communities — which might mean improving housing, water, sanitation, drainage, and waste management — will build resilience and strengthen their adaptive capacity." (Rosa-Aquino, 2019.)
143. OECD, 2018a.
144. Satterthwaithe, 2021.
145. Satterthwaite et al, 2020; Richmond et al, 2018, Fox et al, 2021; Castán Broto et al, 2015; Dobson et al, 2015.
146. Fox et al, 2021.
147. Harvey e al, 2017.
148. Lasage et al, 2015.
149. Khan, 2017.
150. Wilk et al, 2018.
151. Sometime expressed in latin: *Nihil de nobis, sine nobis*
152. Charlton, 1998
153. Tanabe et al,2018.
154. IIED, 2016.
155. Chu et al., 2016; Hughes, 2015.
156. Whyte, 2021.
157. See the Atlas of Informality (https://www.atlasofinformality.com).
158. Watson, 2014.
159. Eidelman and Safransky, 2020.
160. Anguelovski, 2016; Anguelovski et al, 2019; Gould and Lewis, 2016; Rice et al, 2020.
161. Mustafa et al, 2018; Pan er al, 2017.
162. Delazeri et al, 2021; Porst and Sakdapolrak, 2018.
163. Castán Broto and Sanzana Calvet, 2020; Valenzuela-Fuentes et al, 2021.
164. Dorries et al, 2019; McGregor et al, 2020.
165. Schipper et al, 2021.
166. Dorst et al, 2019.
167. Cohen-Shacham et al, 2016.
168. European Commission, n.d.
169. United Nations, 2017; EEA, 2021a.
170. Perrings et al., 2009.
171. Haase, 2021.
172. Langergraber et al, 2020.
173. Unnikrishnan et al., 2020; Girma et al, 2019.
174. Kayanan et al, 2021; Anguelovski et al, 2019.
175. Cilliers, 2021.
176. Norman and Steffen, 2018.
177. Natural Capital Germany – TEEB DE, 2017.
178. Swart et al, 2021.
179. Dorst et al, 2019; Mosler and Hobson, 2021.
180. Meth et al, 2021.
181. Unnikrishnan et al, 2020.
182. See for example: Simon et al, 2004
183. Gagné, 2013.
184. Kabisch et al, 2016.
185. Ziter et al, 2019; Vailshery et al, 2013.
186. Bowler et al, 2010.
187. Liquete et al, 2016.
188. Prefeitura do Município de São Paulo, 2021.
189. Van Hall et al, 2017; Romero-Díaz et al, 2017.
190. Madsen et al, 2017.
191. Łowicki and Piotrowska, 2015.
192. Anguelovski et al, 2019; Gould and Lewis, 2016.
193. Nikolaidis et al, 2017.
194. WRI, 2021.
195. Lafortezza et al, 2018.
196. Elmqvist et al, 2015.
197. Randrup et al, 2020.
198. Go Blue Project (https://goblue.co.ke/)
199. UN-Habitat, 2021c.
200. European Commission, 2020.
201. Benites and Osmond, 2021.
202. Elrayies, 2018.
203. Churkina et al, 2020; Hinkle et al, 2019.
204. Pomponi et al, 2020.
205. Haaland and van Den Bosch, 2015; Garrard et al, 2018; Rhodes, 2017; Parris et al, 2018.
206. Shrestha et al, 2020; Wielemaker et al, 2020; Harada et al, 2018.
207. Directorate-General for Research and Innovation, European

Commission, 2020; Ely and Pittman, 2014.
208. Volans, 2020; Debacker and Manshoven, 2016.
209. Nesbitt et al, 2018; Clavin et al, 2021.
210. Enssle and Kabisch, 2020.
211. Luederitz et al, 2015.
212. Albert et al, 2019; Almenar et al, 2021.
213. Shi et al, 2016.
214. Ziervogel, 2019; Henrique and Tschakert, 2020.
215. UNEP and UN-Habitat, 2021.
216. Anguelovski et al, 2016; Olazabal et al, 2021; Caldeira and Holston, 2015.
217. Kinyanjui, 2014; Chant, 2013; Williams et al, 2015; Kivoi, 2014.
218. Chu and Michael, 2019; Li and Rose, 2017.
219. Tretter, 2016.
220. Bell, 2019, Stafford, 2020.
221. Irazábal and Huerta, 2016.
222. Allen and Slotterback, 2021; Seethaler-Wari, 2018.
223. Castán Broto et al, 2021.
224. Anguelovski, 2016; Anguelovski et al, 2019; Gould and Lewis, 2016.
225. Bigger and Webber, 2021; Long and Rice, 2019.
226. Anguelovski et al, 2016; Warner and Wiegel, 2021.
227. Olajide et al, 2018; Watson, 2009; Kimari, 2016.
228. For example: Mendes Barbosa and Walker, 2020
229. de Sousa Santos, 2015; Pitts, 2017.
230. Chanza and De Wit, 2016; Makondo and Thomas, 2018.
231. Hooli, 2016.
232. Abudu Kasei et al, 2019.
233. Robinson et al, 2016.
234. Anyumba and Sirayi, 2021.
235. Porter and Barry, 2015.
236. West, 2019; Janke and Sentina, 2018; Ford et al, 2016
237. Dorries et al, 2019.
238. Yli-Pelkonen and Kohl, 2005.
239. Singh et al, 2010.
240. Niţă et al, 2018.
241. Olazabal et al, 2021; Kothari, 2002.
242. Olazabal et al, 2021.
243. Fincher and Iveson, 2008.
244. Onyanta, 2016; Michael et al, 2019.
245. Dias, 2016.
246. Ortiz Escalante and Gutiérrez Valdivia, 2015; Huning, 2020; Beebeejaun, 2017.
247. Fredholm, 2015.
248. Weiss, 2014.
249. Perry et al, 2021.
250. Healey, 1997.
251. Ertiö, 2015.
252. He et al, 2017.
253. Aichholzer et al, 2015.
254. Oteros-Rozas et al, 2015.
255. Zapata and Kaza, 2015; Freeth and Drimie, 2016.
256. Oteros-Rozas et al,2015; Malinga et al, 2013.
257. Oteros-Rozas et al,2015; Zapata and Kaza, 2015; Chakraborty, 2011.
258. Zapata and Kaza, 2015.
259. Oteros-Rozas et al, 2015.
260. Freeth and Drimie, 2016.
261. Zapata and Kaza, 2015.
262. Oteros-Rozas et al, 2015.
263. Møller et al, 2019.
264. Billger et al, 2017.
265. Kahila-Tani et al, 2016.
266. John et al, 2015.
267. Mitlin and Bartlett, 2018.
268. Adams and Boateng, 2018.
269. Perry et al, 2018.
270. Watson, 2014.
271. Perry and Atherton, 2017.
272. Satorras et al, 2020.
273. Harman, Taylor and Lane, 2015.
274. Pløger, 2004
275. Pearsall and Anguelovski, 2016, Carter, 2016
276. Ruiz-Campillo, Castán Broto and Westman, 2021
277. Pellow, 2016, Pulido, 2020
278. Gornitza et al, 2020.
279. Stibbe and Prescott, 2020.
280. Gordon and Johnson, 2017; Bäckstrand and Kuyper, 2017.
281. Rayner et al, 2021.
282. Hsu et al, 2019
283. United Nations, 2017.
284. Khan, 2013; Melica et al, 2018.
285. Curtis, 2018.
286. Fünfgeld, 2015.
287. Rashidi and Patt, 2018.
288. Busch et al, 2018.
289. Bansard et al, 2017.
290. Lin, 2018; Gesing, 2018.
291. Domorenok et al, 2020.
292. Rashidi and Patt, 2018.
293. Domorenok et al, 2020; Reckien et al, 2018; Melica et al, 2018.

Chapter 6:

Urban Planning for the Future of Cities

Quick facts

1. While there was a significant drop in climate emissions during COVID-19 lockdowns, the numbers are rapidly increasing towards pre-COVID levels upon easing of public health restrictions.

2. Current urban planning approaches have achieved limited success in reducing urban inequality and achieving social inclusion, a trend that may persist in the future without appropriate intervention.

3. Indoor and outdoor spaces need redesigning or retrofitting to be more flexible and resilient to shocks, disruptions or pandemics looking into the future.

4. Compact cities are resilient to pandemics and a wide range of other shocks and threats.

5. Cities are strongly linked to their hinterlands; therefore, integrating urban-rural linkages in future urban planning approaches is key for the resilience of cities.

Policy points

1. Post-COVID recovery programmes should not only focus on economic recovery but also on social inclusion and climate action.

2. The importance of compact development, managed density and prevention of overcrowding in city resilience should be re-emphasized in view of rising concerns over overcrowding in cities during pandemics.

3. Cities should implement best practices and policy tools such as sustainable neighbourhood planning, the 15-minute city concept and sustainable urban mobility plans (SUMPs) that have been effective in making cities more resilient.

4. Safe, affordable, and reliable public transport systems are sustainable and should be integrated with active mobility.

5. There is an urgent need to focus on strengthening integrated urban and territorial planning approaches that consider interactions between urban, peri-urban and rural areas.

While trends project that rates of urbanization will increase in many parts of the world in the coming decades, unexpected events like the COVID-19 pandemic or the conflict in Ukraine also create unpredictability along that trajectory.[1] As such, preparing for multiple futures that still lead to sustainable and resilient cities able to accommodate rapid urban population growth is a major task that lies ahead of urban planners and decision-makers. How existing and new cities will be developed to accommodate nearly 2.5 billion new inhabitants will have major implications for the future of our planet and for achieving the Sustainable Development Goals. Currently, cities are responsible for more than 70 per cent of global energy consumption and associated greenhouse gas emissions indicating their significance in achieving climate change mitigation targets.[2]

As Chapter 5 highlighted, cities will also be at the forefront of climate change adaptation efforts in the coming decades. Additionally, cities are exposed to a wide range of natural disasters such as floods, extreme heat and sea-level rise. For instance, results of a recent report show that about 20 per cent of urban residents worldwide would be exposed to a 100-year flood, and more than 600 cities are likely to be completely inundated by a 100-year flood.[3] As the urban population in low-lying coastal areas grows, conditions may worsen in the coming decades if cities fail to plan resiliently. Alongside these challenges, cities are also struggling to overcome major inequality issues and provision of equitable access to services and resources to all urban residents.

The COVID-19 global pandemic emerged amidst these challenges and hit many cities hard, underscoring issues related to public health, urban planning and design, and municipal governance. The public health crisis revealed urban vulnerabilities, such as environmental pollution, deep social inequalities, inadequate and inequitable access to urban services, lack of integrated urban management, limited availability of public transportation infrastructure, and limited access to open and green spaces.[4] That many cities have struggled to appropriately plan, prepare for and manage the impacts of the pandemic is a clear indication of the inadequacy of current models and paradigms of urban planning and design that guide urban development in many parts of the world. As pointed out in recent UN-Habitat reports, the outcomes of development processes guided by those models and paradigms do not align with the principles of social, economic, and environmental sustainability.[5] As a result, while cities have traditionally been centres of innovation and could be part of the solution to global challenges such as climate change, existing urban planning and development models seem to be inadequate for building sustainable and resilient cities.

As the urban population in low-lying coastal areas grows, conditions may worsen in the coming decades if cities fail to plan resiliently

The pandemic has provided an opportunity to reflect on urban planning and design principles and ideas that have been practised over the past several decades. This reflection is essential to understand what transformations are needed to streamline sustainability transitions and improve resilience to future pandemics and other stressors looming over cities such as climate change. The pandemic has questioned the fundamental principles of contemporary urban planning and has highlighted social, economic, environmental, and institutional problems that cities have been facing for decades in a new light. Further, it has shown that societies can act quickly and cities can change drastically if needed.

The period from 2020–2022 is not the first time that pandemics have hit cities. Public health crises have always played a significant role in the advancement of urban planning and policy as evidenced by events such as the 1858 Great Stink of London that resulted in sewer management, or the December 1952 smoke-laden fog that was the basis for the introduction and enactment of the 1956 Clean Air Act.[6] Indeed, it can be argued that previous epidemics and pandemics such as tuberculosis and the Spanish Flu prompted the birth of modern urbanism. Hygienic measures and non-pharmaceutical interventions such as wastewater treatment, waste management, sewage control, indoor air circulation and lighting, and building height-to-width ratio have emerged in response to such public health threats.[7]

While COVID-19 is not yet endemic and many aspects of the disease are still being explored, a lot of research on cities and the pandemic has been published since early 2020.[8] Now is the time to reflect on the impacts of COVID-19 on cities to understand their inherent vulnerabilities and draw lessons for building back in a better and more resilient way that ensures better coping, absorption and recovery capacities when confronted with future shocks. The pandemic has led to many changes to previously normal ways of living. While it is too early to say whether such changes are temporary or permanent, it can be argued that the pandemic will have significant implications for urban life and the way cities will be developed and managed in the future. Indeed, recent

Tyumen region, Russia. Aerial view of the residential area of the suburb of Nizhnevartovsk during the flood of 2015. © Vladimir Melnikov/Shutterstock

trends such as the accelerating uptake of smart solutions and technologies,[9] rapid adoption of teleworking, and flight from high-density inner-city neighbourhoods attests that there is a prospect for some major changes in the post-COVID era.[10]

The critical role of cities in dealing with global challenges and the need to revisit urban planning, design and management were already well-recognized before the pandemic. Since the landmark year of 2007, when the world's urban population exceeded the rural population for the first time, attention to cities has been growing steadily. This trend is manifested by the allocation of a separate chapter to cities and human settlements in the research of the Intergovernmental Panel on Climate Change since the Fifth Assessment Report in 2014 and agreements on several major international policy frameworks such as the New Urban Agenda, 2030 Agenda for Sustainable Development, Sendai Framework for Disaster Risk Reduction, Addis Ababa Action Agenda, and Paris Agreement on Climate Change, which all have specific relevancy to cities and their future. Amidst such initiatives and efforts to guide future urban planning and development, the pandemic has further highlighted the unsustainable current trajectories of urban growth and development and added a sense of urgency on the need to take concerted actions across different scales and streamline the global urban transition towards more sustainable futures.

The UN-Habitat reports *World Cities Report 2020* and *Cities and Pandemics: Towards a More Just, Green and Healthy Future* highlight how well-planned, managed and financed cities can create value. That value, in turn, can be harnessed for sustainable urban futures and provide the basis for local and regional actions that can be taken to facilitate a better and more sustainable recovery from the pandemic.

The critical role of cities in dealing with global challenges and the need to revisit urban planning, design and management were already well-recognized before the pandemic

This chapter builds on these efforts by focusing on some major planning-related issues that emanate from the recent crisis, namely the need for green, inclusive and sustainable recovery; retrofitting urban infrastructure to allow for safe social distancing when necessary; measures to promote the compact city; the need for sustainable neighbourhood planning and design; the significance of safe, affordable and reliable public transportation systems for the future; and the importance of multi-level and integrated planning approaches that account for dynamic interactions across urban-rural interfaces. While there is a major emphasis on the pandemic, issues discussed in the chapter are not exclusive to it. Rather, other important challenges facing cities are also discussed, such as climate change. Additionally, the chapter avoids providing case-specific recommendations since context is important, and what can work in a specific city may not work elsewhere. Instead, the general ideas and principles discussed here will provide a basis for context-specific local actions that will enable cities to enhance their resilience to future pandemics and make progress towards achieving the SDGs.

6.1. Urban Planning for Sustainable and Inclusive Recovery

Modern urban planning has traditionally been aligned with state authority and highly influenced by market forces. Therefore, it has tended to favour economic growth and the needs of middle- and high-income people while largely failing to be socially inclusive and protect the environment. As a result, many cities are locked into undesirable and unsustainable models. While market forces are still dominant, some paradigm shifts towards more inclusive and sustainable urban development have been made in the past several years. However, urbanization in some developing countries has been so rapid that urban planning and infrastructure have not developed sufficiently to meet the demands of all urban residents in a sustainable and timely manner. Additionally, some countries lack the financial means to support sustainable infrastructure development for all.

The COVID-19 pandemic is a window of opportunity to evolve revisiting current urban planning paradigms and identifying shortcomings and areas that need improvement to inform a more green and inclusive recovery.[11]

6.1.1. Planning a decarbonized recovery

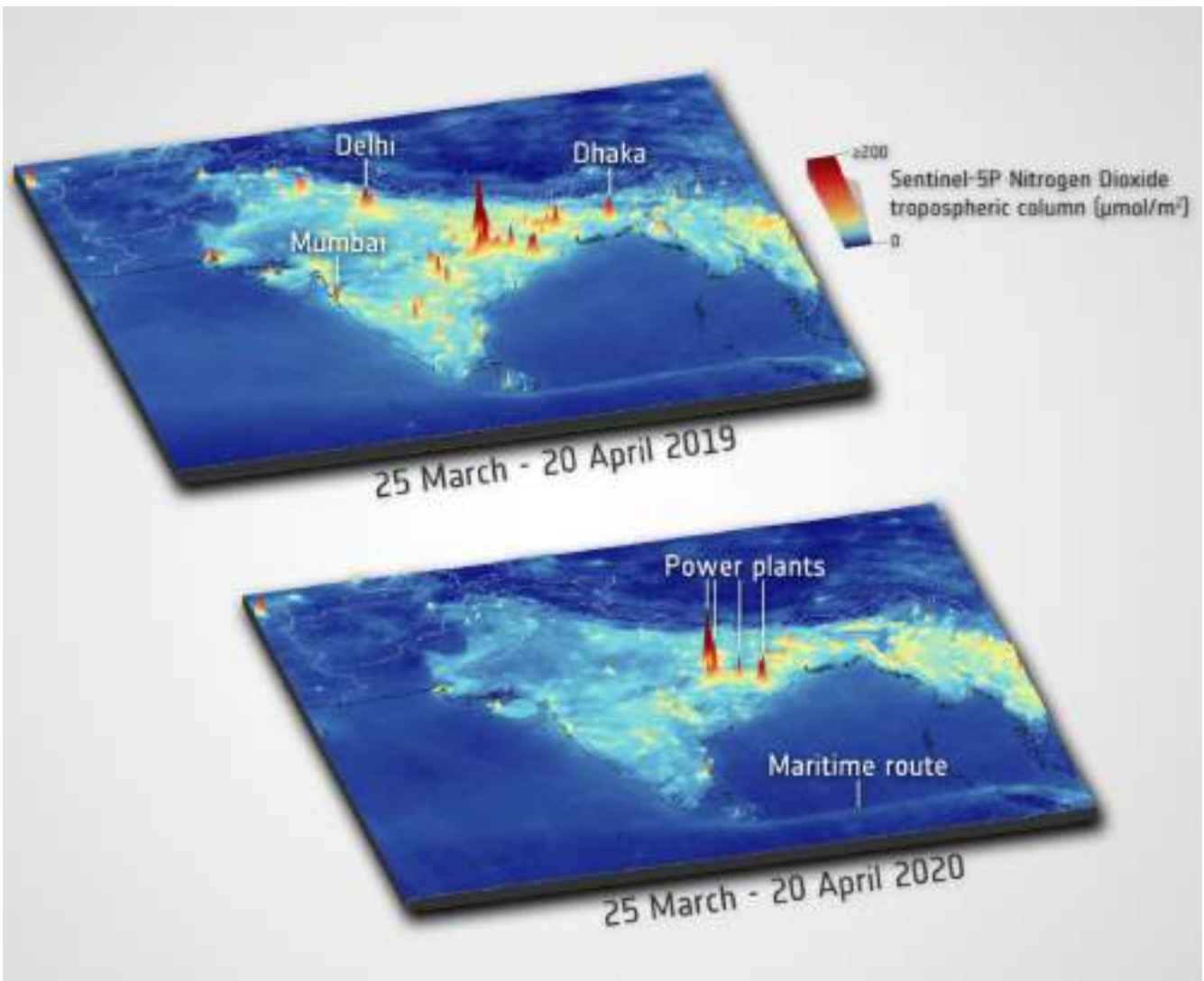
As arguments on the need for deep decarbonization continue to gain ascendancy, temporary dips in pollution during the early phase of the pandemic illustrate the beneficial outcomes of greening transportation systems and cleaning up heavy industries as discussed in detail in Chapter 5.[12] While lockdowns halted urban travel patterns abruptly for knowledge workers, the post-pandemic trend toward a hybrid model where office workers no longer come in five days per week has the potential to reduce peak travel demand and pollution. Furthermore, as will be further discussed later

in this chapter, investment in and promotion of public and active transportation systems especially in cities should be prioritized. Such actions will enhance urban resilience to future adverse events and contribute to climate change adaptation and mitigation in cities.[13]

In response to the pandemic, many governments worldwide imposed lockdowns and mobility restrictions, the result of which were major improvements in air and water quality. Many cities around the world, especially those in developing countries such as China and India, reported unprecedented reductions in the level of airborne pollutants such as $PM_{2.5}$, PM_{10}, CO_2, NO_2 and SO_2. Declines were significant in cities that imposed lockdowns given the dominance of road transportation and associated emissions in urban areas (Figure 6.1).[14]

However, recent reports on the growth rate of carbon dioxide emissions post-lockdowns do not indicate an ongoing green recovery. As countries eased mobility and activity restrictions and return to pre-pandemic normal emissions increased rapidly (Figure 6.3, Figure 6.2 and Box 6.1) and even reached a record high level in 2021.[15] Either recovery packages are not prioritizing green growth, or the pandemic has caused delays in the implementation of some climate action plans.

Figure 6.1: Reductions in NO_2 concentrations over India following COVID-19 lockdowns



Source: European Space Agency, 2022.

Figure 6.2: Short-term comparison of $PM_{2.5}$ levels in major cities before, during and after lockdown restrictions imposed by governments at the beginning of the pandemic

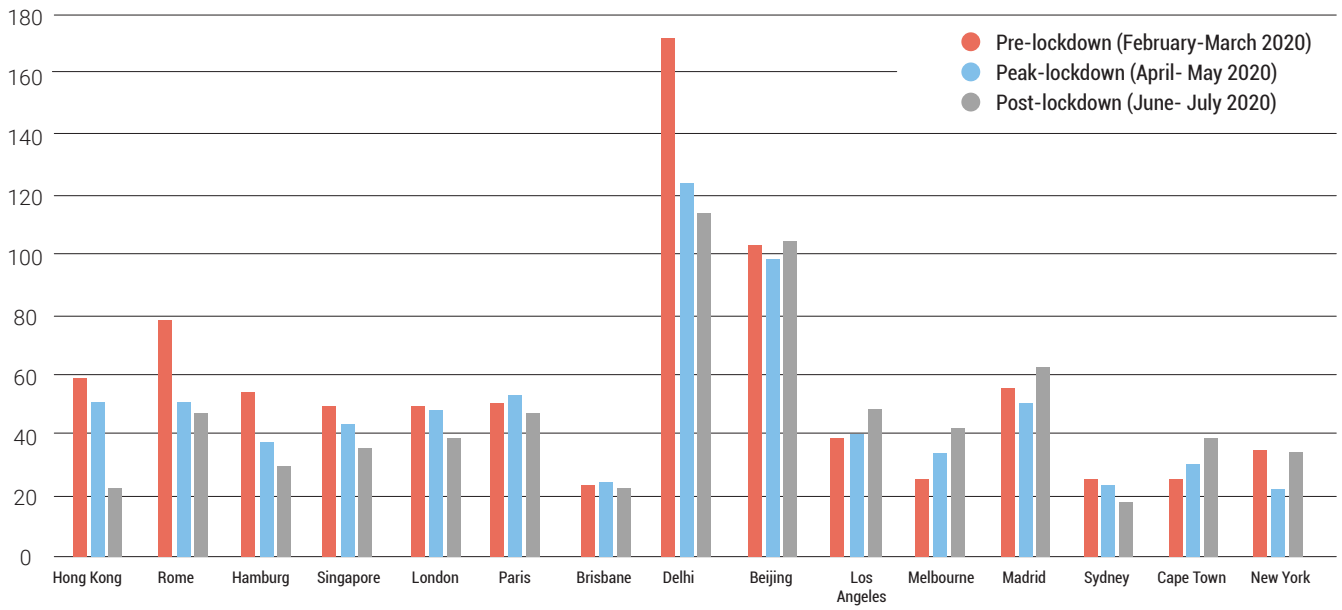


Figure 6.3: Temporary reduction in global greenhouse gas emissions during the first half of 2020 and rapid recovery in the second half

Source: UNEP, 2020.

Box 6.1: Global emissions almost back to pre-pandemic levels after unprecedented drop in 2020

Global CO_2 emissions from fossil fuels dropped by 5.4 per cent in 2020, compared to the previous year. But they are set to increase by about 4.9 per cent above 2020 levels in 2021, reaching 36.4 billion tonnes. The fast growth in emissions matches the corresponding large increase in energy demand as the global economy opens, with the help of US$17.2 trillion in economic stimulus packages around the world. CO_2 emissions from all fossil fuel types (coal, oil and natural gas) grew in 2021, with emissions from coal and natural gas set to grow more in 2021 than they fell in 2020. Emissions from global coal use were declining before the pandemic hit in early 2020 but they surged back in 2021. Emissions from global gas use have returned to the rising trend seen before the pandemic. CO_2 emissions from global oil use remain well below pre-pandemic levels but are expected to increase in the coming years as road transport and aviation recover from COVID-related restrictions.

Source: Canadell et al., 2021.

Based on such observations, experts working at the nexus of science and public policy urge leaders at all levels to align pandemic recovery plans and programmes with global, national and local climate action plans in order to minimize climate risks and provide co-benefits for health and equity.[16] One important lesson from the pandemic is that cities that have taken early actions to contain the spread of COVID-19 have been more successful in controlling outbreaks.[17] Drawing a parallel between public health measures and urban climate action, it can be argued that timely climate policy at the city level is essential to reduce the future costs associated with climate change adaptation and mitigation in cities and building resilience to pandemics.[18]

Experts working at the nexus of science and public policy urge leaders at all levels to align pandemic recovery plans and programmes with global, national and local climate action plans

Cities and Pandemics: Towards a More Just, Green and Healthy Future provides city stakeholders with guidelines for planned recovery towards sustainable cities. Cities are encouraged to build resilience to future shocks and stresses by investing in and transforming urban weak spots, both systemic (such as car-based movement systems) and area-based (informal settlements, suburban and peri-urban areas). Additionally, well-designed urban density, at a human scale that includes adequate facilities and functions to balance long-term social, economic and environmental sustainability, can enable a level of resilience to the impacts of pandemics without compromising liveability. Planning for transition away from automobile-oriented models with single land uses towards more pedestrian-oriented, mixed-use, diverse and compact city plans will create more flexible and adaptive urban forms to respond to future pandemics.[19]

Planning for transition away from automobile-oriented models with single land uses towards more pedestrian-oriented, mixed-use, diverse and compact city plans will create more flexible and adaptive urban forms to respond to future pandemics

6.1.2 Planning a socially inclusive recovery

Major achievements were made in reducing the share of people living in extreme poverty following the implementation of the Millennium Development Goals. However, the reduction rate slowed down to only about 1.8 per cent between 2015 and 2019. In 2020, the pandemic exacerbated global extreme poverty for the first time in more than 20 years due to a combination of factors such as loss of employment, economic stagnation, and decreased remittance to low- and middle-income countries. This setback added about 120 million people to those living below the poverty line (Chapter 3). Furthermore, foreign direct investment in developing countries dropped by 8 per cent in 2020 compared with 2019.[20] Considering these impacts, many cities in vulnerable developing countries are likely to decide to prioritize economic growth. Under such circumstances, international cooperation in providing financial support to facilitate inclusive recovery is indispensable.

Previous pandemics have demonstrated that vulnerable groups such as ethnic minorities, the urban poor, women[21] and children are disproportionately affected, making it

difficult to contain the spread of infectious diseases in cities.[22] Despite this historical precedent, modern urban planning has achieved limited success in ensuring equitable distribution of resources, and profound inequalities have existed in cities for several decades. Most notably, close to 30 per cent of the world's urban population lives in slums or slum-like conditions.[23] Compliance with social distancing and hygiene guidelines recommended for containing the spread of the virus in such contexts is difficult, if not impossible.

Overcrowded environments are not conducive to social distancing. For instance, the average per capita floor area for 60 per cent of urban residents in India is about 6 square metres.[24] People living in slums are often cramped with limited or no access to clean water and sanitation. Consequently, slum dwellers face challenges in following hand-washing guidelines and contaminated water resources may also further increase the risk of pathogen spread. In addition to these issues, slum dwellers often have precarious livelihood conditions and cannot afford to stay at home during pandemics. In response to a growing volume of requests from both national and local governments to help them prepare for, prevent, respond to and recover from the COVID-19 pandemic in an equitable manner, UN-Habitat adopted a COVID-19 response plan focusing on city-level and community responses to the crisis (Box 6.2). These responses seek to empower local communities to harness local capacities in addressing their immediate challenges as more long term interventions are planned by decision-making stakeholders.

Pandemics have demonstrated that vulnerable groups are disproportionately affected, making it difficult to contain the spread of infectious diseases in cities

Box 6.2: UN-Habitat expands COVID-19 prevention in Kenya's Mathare and Kibera informal settlements through youth-led groups

Nearly 5,000 school children in two informal settlements in the Kenyan capital are better protected against COVID-19 as a result of an UN-Habitat initiative to expand mask and recycling bins in those often-overlooked areas.

The three-week initiative in Mathare and Kibera informal settlements is in line with UN-Habitat's commitment not only to upgrade the quality of life in slums worldwide but also to ensure a more equitable distribution of resources to all citizens as a step toward providing more sustainable urban development.

The Youth-led COVID-19 Emergency Response initiative, in partnership with local governments, comes under UN-Habitat COVID-19 Response Plan adopted in April, 2020, which has as one of its main objectives as leveraging on experience, expertise and partnerships to deliver localized solutions. UN-Habitat has an extensive network of youth partners built up over its 20 years of programming with young people globally. Working with these partners on the ground, the organization brought together central and local governments, youth, communities and United Nations agencies to make the COVID-19 response impactful, especially with those in informal settlements and slums.

One key prevention method is masks. The most recent mask initiative facilitated the distribution of 6,577 surgical face masks to 2,226 students in seven schools in Mathare and 8,730 masks to 2,500 students in five schools in Kibera, for a total of 15,307 masks distributed to 4,726 students. To limit the environmental impact of disposable masks and promote economic empowerment among women, the elastic cords from the masks will be reused by women tailoring cooperatives. Along with the masks, recycling bins were also distributed to each of the schools.

The United States Centers for Disease Control and Prevention say students benefit from in-person learning and recommends universal indoor masking for all students.

Source: UN-Habitat, 2022b.

The nature of infectious diseases is such that no one is safe until everyone is safe. Consequently, reducing urban inequalities should be a priority in the post-COVID era. Equitable access to urban infrastructure and services, especially healthcare, has been an important determining factor in the ability of cities to respond to the pandemic effectively.[25] Post-COVID recovery should be equitable and inclusive while prioritizing the needs of vulnerable and marginalized groups, including ethnic minorities, urban poor, immigrants, refugees, women[26], children and those who are precariously employed or housed.

To seize the pandemic as an opportunity to reform our cities and build back better, it is essential to carefully assess the impacts on marginalized groups and ensure that they are engaged in current and future planning processes. Ensuring the engagement of diverse social groups in the planning process is necessary to develop inclusive and equitable plans that respect

The engagement of diverse social groups in the planning process is necessary to develop inclusive and equitable plans

the needs and demands of different groups and facilitate equitable access to urban services and amenities such as open spaces and health infrastructure. This approach, in turn, could contribute to better resilience against future threats.[27] Given the complexity of urban issues, post-pandemic recovery measures aimed at improving the accessibility of certain social groups to urban services should not undermine the accessibility of other groups. For instance, while as will be discussed in the next section, the need for better access to green, open and public spaces has been observed in many cities, actions centred on increasing the share of such spaces should not negatively impact those who are employed in the informal sector and are reliant on public spaces for their livelihood. It is estimated that over 2 billion people across the globe are employed in the informal sector, and these people are the main users of streets and public spaces in developing countries contributing to the liveability and vibrancy of cities.[28] In Mexico, for instance, street vendors are an integral part of many cities, and more than 50 per cent of the working population is involved in informal economic activities. Response measures should take the rights of such groups into account.[29]

Measures aimed at general economic recovery should not worsen the living conditions of vulnerable groups. For example, recovery from the 2008 global financial crisis resulted in unprecedented growth in international urban tourism and led to the displacement of low-income residents from central neighbourhoods to peripheral urban areas as property owners converted housing into short-term holiday rentals. Housing advocates fear that returning to pre-pandemic patterns will result in gentrification by displacing the original residents that can no longer afford higher rents and further exacerbate the existing socio-economic and spatial inequalities in cities.[30] However, some municipal authorities took advantage of the pandemic pause in short-term rentals to plan for a better-regulated, more equitable future (Box 6.3).

Measures aimed at general economic recovery should not worsen the living conditions of vulnerable groups

Box 6.3: Regulating the short-term rental market

During a gloomy winter in a French capital subdued by the COVID-19 pandemic and missing its usual throngs of visitors, 30 Parisians logged on to a videoconferencing platform over 10 sessions to discuss a once contentious issue: short-term lets. Nearly six months before France would reopen to international tourists, the Citizens Conference on Furnished Tourism Accommodation had gathered to hear a range of perspectives and make a recommendation on one difficult question: to improve access to housing, should regulations on furnished tourism accommodation be stricter? And if so, how?

The Mayor of Paris called the public meeting because her administration had highlighted the growth in short-term lets as a culprit in the city's housing crunch. "Paris has been confronted for several years now with the frenetic development of these tourist rentals," said the deputy mayor for housing. "This development has come at the detriment of housing, that is to say we've seen housing turned into clandestine hotels."

These debates have been playing out in cities across a world that experienced a rapid rise in short-term lets during the 2010s, followed by a severe crash during the COVID-19 pandemic and an uncertain future as travel and tourism make an unsteady return. Tourism dollars are sorely missed where local authorities are grappling with ailing municipal coffers, but the spectre of a worsening housing shortage looms large. "Local governments need to find a middle ground between maintaining their cities' attractiveness to visitors while tackling housing inequalities, protecting long-term residential uses and quality of life," says a University College of London's Professor and lead author of a new study on European short-term lets published by the Property Research Trust.

The report analysed 12 European cities and found that in 2019, professional landlords (defined as renting a property for more than 60 nights a year) commanded the lion's share of Airbnb listings in several popular destinations like Prague, Lisbon, and Rome. In the latter two, over 80 per cent of listings appeared to consist of professional landlords and in all four of these European destinations, some two-thirds of listings could be traced to hosts with multiple properties on the platform.

Catching up has been a challenge for cities caught unawares by sophisticated technology platforms that have rapidly scaled up the number of short-term let listings before regulatory measures like licenses, taxes, and nightly limits have been put in place. Some cities have adopted a zone approach, like Montréal, Canada, which pushes short-term lets off quiet residential streets and onto arterial boulevards. Some cities have taken a tougher approach, with Barcelona, Spain, becoming the first major city in Europe to ban private room short-term rentals altogether.

Source: Scruggs, 2021.

Urban outmigration may intensify patterns of gentrification outside central cities and further exacerbate housing and wealth inequalities across the urban-rural continuum

Avoiding gentrification is essential to ensure that all urban dwellers' right to the city is respected, as elaborated[31] in Chapter 8. This aspiration can be achieved by adopting integrated planning mechanisms that address urban issues through systemic approaches, such as policies requiring the social function of property. Similarly, based on urban exodus trends observed in contexts as diverse as Hyderabad, India[32], and London, in the absence of measures to support existing residents of suburban and rural areas, urban outmigration may intensify patterns of gentrification outside central cities and further exacerbate housing and wealth inequalities across the urban-rural continuum.

6.2. Retrofitting Urban Spaces for Safe Social Distancing

The pandemic and associated guidelines for safe social distancing have transformed the way people perceive the built environment, especially building interiors. COVID-19 has prompted a rethinking of the human relationship to green, open and public spaces. It has increased the demand for multi-purpose and flexible spaces that can adapt to new situation, which is a major shift from traditional urban planning practices like single-use zoning that often overlook flexibility and adaptability. This section is focused on issues related to the retrofitting of indoor and outdoor spaces to allow for social distancing, a trend that has softened in 2022 but that may have lasting effects for commercial design. However, it should be mentioned that planning to retrofit urban infrastructure is also needed to futureproof against other adverse events like climate change impacts, seismic risks and terrorist attacks.[33] Furthermore, as insufficient indoor and outdoor spaces have been identified as risk factors to human distress during the pandemic, retrofitting indoor and outdoor spaces has also been linked to urban dwellers' health and well-being demands[34].

6.2.1. Retrofitting indoor spaces

Architects, interior designers, and facility maintenance managers have rushed to retrofit indoor spaces since 2020 both to improve ventilation as well as to accommodate changing work and lifestyle patterns that have led many urban dwellers to spend more time at home. Indoor residential environments are no longer only spaces for living, but also must accommodate other needs related to work and leisure. This sudden shift revealed the lack of versatility and flexibility of modern building design and indicated that changes in the design layout of buildings may be necessary[35].

Consequently, property analysts believe there will likely be long-term demand for adaptable residential designs that can accommodate the changing needs of citizens during emergencies such as pandemics (e.g. garages that can be turned into office space). This design preference will increase demand for suburban and peripheral housing stock with gardens, garages and off-street parking.[36] Such consumer demand away from dense, multifamily housing will cause affordability issues, and worsen economic inequalities given the difficulties prompted by the pandemic. As a result, wealth inequalities in society may further deepen as some will own multiple homes while others will find it challenging to own or rent a single home.[37]

Accordingly, developing policies and strategies to provide affordable housing should be further prioritized to mitigate housing inequality and its potential associated risks for public health. In this regard, lessons can be learned from successful examples such as the The Million Homes Programme implemented in Sweden in the post-war era.[38] Another risk is that increased interest in suburban and rural areas, with less population density and more flexible housing that can accommodate the need for working from home, may lead to new waves of suburban urban development.[39] As will be discussed later in this chapter, teleworking or remote work may undermine efforts to promote compact cities.

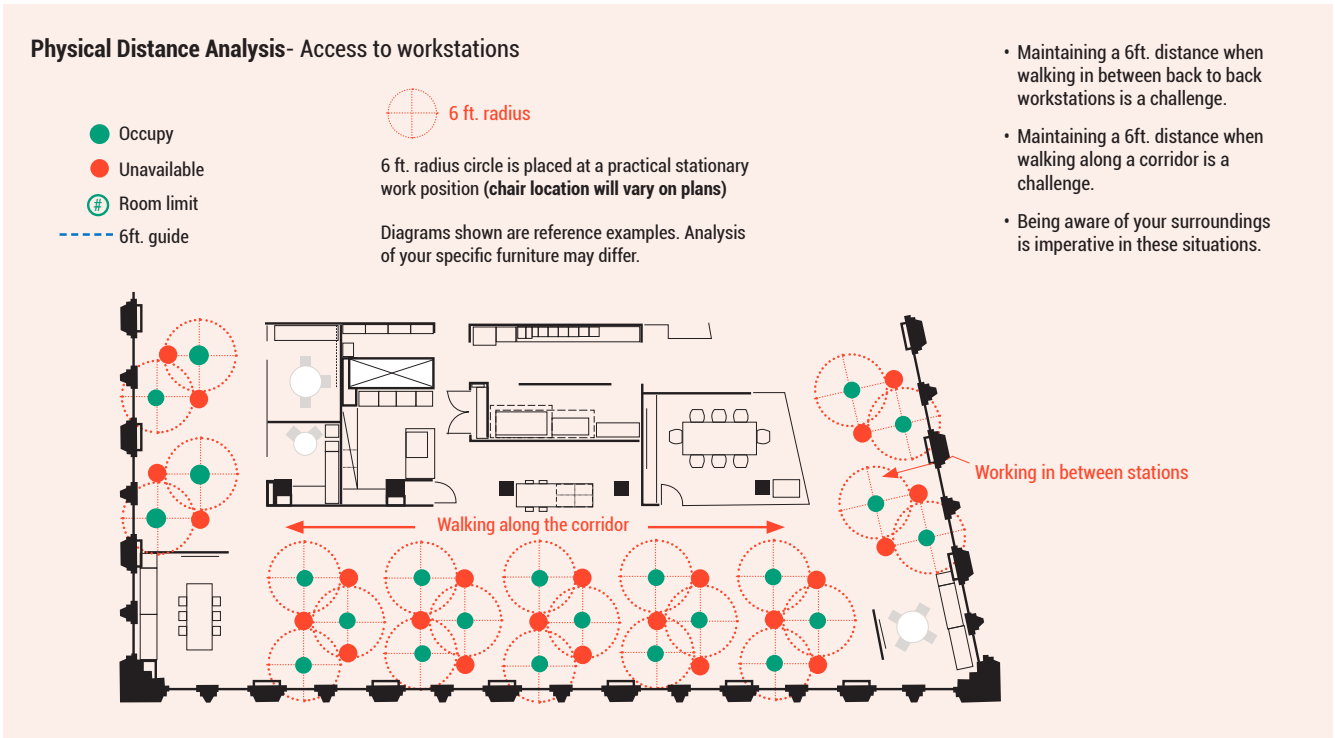
Affordable housing should be further prioritized to mitigate housing inequality and its potential associated risks for public health

During the peak of the COVID-19 pandemic, many temporary measures were taken to reduce contagion risk in indoor environments, such as separating upward and downward staircases, making shop aisles one way, limiting indoor occupancy and reducing elevator passenger loads. As the pandemic recedes, these regulatory responses are likely to recede, if they have not already, as they reduce the efficiency of indoor spaces. Other measures are more capital-intensive and thus will likely remain once installed, such as ventilation system upgrades, body temperature scanners and anti-microbial finishings.[40] However, these measures are costly and may not be affordable to all social groups.

The pandemic is also likely to transform the configuration of offices (Figure 6.4) and commercial spaces such as shopping malls. Regarding office spaces, measures mentioned above to avoid overcrowded indoor environments can be combined with further adoption and promotion of teleworking to allow for better social distancing and more economically feasible ventilation of indoor working environments. Survey results show that support for remote work has increased among both employers and employees after the pandemic. Teleworking also helps reduce transport-related energy consumption and associated GHG emissions and could facilitate social benefits such as job satisfaction and better work-life balance.[41] Additionally, reducing office size could provide opportunities for re-allocating the freed spaces to other purposes such as green and open spaces. However, telework should be combined with in-person work to maintain the innovation advantage inherent in cities and sustain the economies of central business districts, which provide jobs to small business owners and low-wage workers.

People waiting for a city bus as they are maintaining social distancing, Assam, India. © Talukdar David/Shutterstock

Figure 6.4: Guidelines for a safe return to the office during COVID-19



Source: Harrouk, 2020

Over the past few decades, large indoor shopping malls and hypermarkets have become common in many cities. The temporary disruption of the COVID-19 pandemic has shuttered some malls, although as the pandemic recedes shoppers have returned to these large indoor spaces. Moreover, these facilities are typically owned by well-capitalized property firms that have adequate balance sheets to withstand a downturn. However, the pandemic-era consumer preference for outdoor spaces has helped the fortunes of open-air shopping centres and traditional high streets and commercial corridors.[42] Neighbourhood-oriented mixed-use development can offer opportunities for the revival of such shops. Evidence based on perception surveys in Istanbul shows that due to concerns over the effectiveness of artificial ventilation in shopping malls, some customers are likely to avoid such privately-owned public spaces in the future and shift to traditional shopping streets.[43] This trend presents an opportunity to revive neighbourhood shopping streets as welcoming public spaces that contribute to local economies, facilitate social interactions, cultivate a sense of community, encourage walking and cycling, and reduce travel demand and associated GHG emissions.[44]

Urban planners should support neighbourhood shopping districts with easier permitting, permission to use sidewalks and streets to extend storefronts, street beautification efforts and support for business improvement associations, where enabling legislation allows. Neighbourhood retail faces headwinds from online shopping, which saps urban vitality and contributes to congestion through increased delivery vehicles. New property uses like ghost kitchens, which prepare meals for delivery but do not drive foot traffic, should be regulated closely so that they do not occupy prime commercial real estate.

6.2.2. Retrofitting outdoor spaces (green, open and public)

As evidenced by SDG 11, the need for adequate provision and universal access to safe green, open and public spaces was already recognized before the pandemic. The New Urban Agenda highlights the profound roles that multi-functional green, open and public spaces such as streets, pedestrian spaces, cycling networks, squares, parks and green spaces can play in driving economic development and contributing to human health and well-being. The pandemic brought about more desire for green, open and public spaces, which is likely to change the distribution patterns of such spaces in the coming years. Many argue that the pandemic will have significant implications for the way urban residents will see and use green, open and public spaces in the future.[45] This preference is likely to increase the demand for such spaces, leading to urban form and landscape changes.

New Urban Agenda highlights the profound roles that multi-functional green, open and public spaces can play in driving economic development and contributing to human health and well-being

Effective strategies to ensure continuous use of parks and open spaces by citizens are critical for maintaining their mental and physical health. Outdoor physical activity is essential for healthy child development, avoiding cardiovascular and respiratory diseases, reducing obesity rates and building children's social and emotional skills. During lockdowns many people were alienated from their work and leisure places as well as from other people, which heightened stress and anxiety among urban residents. Results from a survey completed by people from nine countries show that contact with nature and green spaces is essential for overcoming depression and anxiety during lockdown periods.[46]

Despite this benefit, in many cities around the world, use of such spaces was largely restricted during the pandemic. Better design measures, allocating more space to parks and improving accessibility are critical to avoid similar conditions in the future.[47] As will be further discussed later in this chapter, the pandemic has increased interest in active transportation like cycling and walking. This change offers an unprecedented opportunity to restructure cities in such a way that more space is devoted to developing cycling and pedestrian infrastructure. It will allow better opportunities for compliance with social distancing during future respiratory pandemics and provide spaces for further social activities and social interaction that could strengthen resilience. Further, it will have co-benefits for health and climate change mitigation.

Following the increased interest in active transportation, the global movement to reconfigure streets making them more pedestrian- and cyclist-friendly has gained considerable momentum (Box 6.4).[48] More cities should seize this opportunity to start transforming urban environment, including streets. and open and public spaces. Indeed, it should be acknowledged that streets should not just be allocated to cars and need to be reconfigured in a people-centred manner. In so doing, careful attention to the principles of resilient urban

During lockdowns many people were alienated from their work and leisure places as well as from other people, which heightened stress and anxiety among urban residents

Street re-allocation to ensure social distancing in London
Source: (https://www.cnbc.com/2020/05/06/coronavirus-uk-social-distancing-set-to-transform-london-sidewalks.html)

Box 6.4: Scaling up safe street designs in Addis Ababa

Like many low-and middle-income countries, Ethiopia is confronted with a very high road-related fatality rate, with 26.7 road deaths per 100,000 inhabitants recorded each year, according to WHO data. In comparison, high-income countries have an average of 8.3 road traffic deaths per 100,000 people. Death rates from traffic crashes are higher in Africa than anywhere else.

In Addis Ababa, pedestrians and cyclists represent more than half of road users and about 80% of all road victims. Building safe and inclusive walking and cycling infrastructure is crucial to reduce road injuries and mortality.

Since May 2019, UN-Habitat, supported by the United Nations Road Safety Fund and in partnership with the Institute for Transportation and Development Policy (ITDP), the Ethiopian Ministry of Transport, the Ministry of Urban Development and Construction, the Federal Transport Authority and the Addis Ababa Transport Bureau, with support from other national, international and local agencies, have partnered on the Scaling Up Safe Street Designs in Ethiopia project to help the authorities tackle this key road safety challenge.

The project has now reached its completion, delivering results and impact which have exceeded all its initial goals. The project provided technical support to local and national government officials in their ongoing efforts to design, install and upgrade footpaths and bicycle lanes and corridors, supported by the harmonization of street design guidelines. Based on this expertise, the project partners provided technical review assistance to the design of ongoing infrastructure projects, and promoted and co-organized street-level activities to raise awareness around the importance of walking and cycling for all, and road safety issues.

The project resulted in the adoption of a Non-Motorized Transport Strategy for Ethiopia and Addis Ababa, and a five-year implementation plan for 69 cities and towns with harmonized street design guidelines guiding investments in safer facilities for walking and cycling. The Strategy emphasizes the need to consider all residents in the plans and budgets, including women, children, and persons with disabilities.

Source: UNECE, 2021b.

The global movement to reconfigure streets making them more pedestrian- and cyclist-friendly has gained considerable momentum

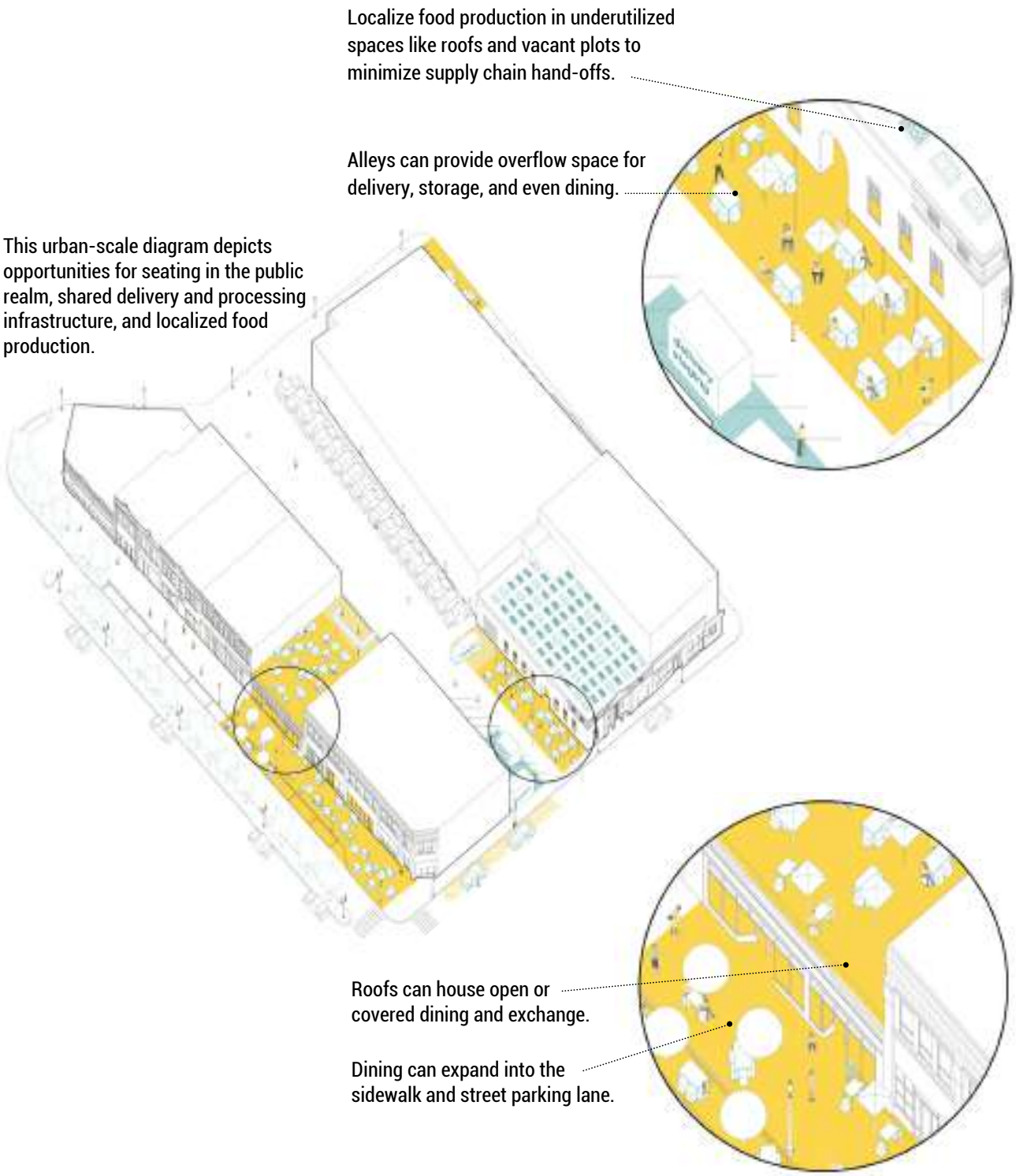
form should be made to ensure designing open and public spaces in a redundant, multi-functional, and flexible manner that allows adaptability to various types of adverse events.

Ample provision of open and public spaces increases urban flexibility and resilience. Such spaces can be converted into sites for artistic activities, outdoor dining, temporary shelter or medical emergency sites during adverse events.[49] For instance, during the recent pandemic large-scale open and public spaces were converted into makeshift hospitals in Wuhan, China. Open and public spaces have also been used for similar purposes in other countries like Japan. Such practices and other measures based on the principles of tactical urbanism can be used to enhance the resilience of urban form.[50]

Integrating green infrastructure into the design of streets and other public spaces is an effective way to enhance their flexibility and multi-functionality. Indeed, creating networks of green areas and open spaces will allow better responses to future pandemics while also providing co-benefits like climate change adaptation and ecological restoration. Networks of blue and green infrastructure can also buffer and regulate interactions between humans and wildlife, reducing the risk of zoonotic diseases.[51] But planning for this type of infrastructure requires a change from business-as-usual practices, which historically defer to hard infrastructure in order to solve urban development challenges. Major barriers are limited funding and expertise, maintenance costs, and inadequate support from local governments.

To ensure that green infrastructure networks can contribute to transformative solutions for better urban futures, these barriers should be overcome by, among other things, better engagement of different stakeholders for co-design and

Figure 6.5: Spatial strategies for restaurants in response to COVID-19



Source: MASS Design Group, 2020.

Repurposing open space to set up emergency treatment centres in Saitama Japan
Source: https://www.japantimes.co.jp/news/2021/09/05/national/coronavirus-japan-temporary-treatment-sites/)

co-implementation of projects, knowledge production and capacity building, and using assessment and monitoring tools for objective communication of the benefits.[52] Urban residents' recent interest in green spaces provides a key opportunity to garner support for the extension of green infrastructure networks, which could help overcome some barriers.

One important issue that needs to be considered when reconfiguring green, open and public spaces is that they should be designed and distributed properly so that physical accessibility for all social groups, including children and youth, women, older persons, and people with mobility restrictions, can be guaranteed. Planning for marginalized populations avoids taking response measures that will exacerbate the living conditions of vulnerable groups. For instance, allocating more space to walking and cycling could negatively impact the accessibility of other groups such as essential workers who need rapid mobility. Such essential workers are often from low-income and marginalized groups who cannot work from home. Therefore, street reallocation programmes should be implemented so as not to exacerbate inequality.[53]

Creating networks of green areas and open spaces will allow better responses to future pandemics while also providing co-benefits like climate change adaptation and ecological restoration

A recent study conducted in Seattle, US; Washington, D.C., US;, and Vancouver, Canada, demonstrates that such initiatives have been implemented in neighbourhoods home to recent immigrants, low-income families, people with disabilities and racial minorities. Therefore, while temporary reallocation is helpful for meeting resident needs during the pandemic (e.g. social distancing and daily exercise), their permanent implementation should be analysed through an equity lens.[54]

6.3. Promoting Compact Urban Development

The adoption of the New Urban Agenda in 2016 codified a global vision of compact urban development that would check unplanned urban expansion and so-called suburban sprawl. Such development patterns became common with the advent of the automobile and have led to a number of adverse consequences. This land-intensive pattern contributes to environmental degradation, deforestation and habitat loss. By engineering long distances between work, home, commerce, school and leisure, dispersed urban development leads to social isolation, less physical activity and increased

GHG emissions per capita. Serving fewer residents with the same amount of roads, sidewalks and utilities leads to higher public cost burdens to maintain infrastructure. Allowing more affluent residents to wall themselves off in gated communities or distant suburbs defined by exclusionary single-use zoning engenders socio-spatial segregation and worsens social cohesion.[55] Finally, in the wake of the COVID-19 pandemic, urban development that encroaches on wild places increases the risk of exposure to zoonotic diseases.[56]

New Urban Agenda in 2016 codified a global vision of compact urban development that would check unplanned urban expansion and so-called suburban sprawl

There are now concerns that the COVID-19 pandemic could result in a new wave of suburbanization due to perceptions of higher contagion risk in high-density areas, the need for more space to fulfil work and leisure needs during lockdowns, and the accelerated trends of remote working that reduce the need to commute to central business districts. Expensive mega-cities in land-rich countries saw population loss as some residents moved to ensure better access to open and green spaces and avoid overcrowded urban life.[57] While it is still too early to say whether these trends are temporary or people will start to move back to big cities as the pandemic slows down, there is an urgent need for urban planners to examine the performance of compact cities during the pandemic and take necessary actions to ensure that compact cities will not lose their appeal.

6.3.1. Density (population, housing, built environment) and public health

Concerns over the role of density in the spread of contagious diseases date back decades. The link between population density and public health was one of the main themes of the First International Congress for Sanitation and Housing Health Safety held in Paris in 1904. Studies in the past have shown an association between infectious disease mortality (tuberculosis) and housing density as social distancing is challenging in poorly designed, high-density areas that could lead to overcrowding.[58] Research results reported on the association between density and the number of COVID-19 cases and death are inconclusive. Some studies have shown an overlap between population density and COVID morbidity and mortality rates in countries such as China, Iran and Chile.[59] However, in most cases there is no compelling evidence that density is a risk factor.[60] Similarly, there is no strong evidence suggesting that larger cities are more vulnerable. Comparing mortality rates in different cities shows that except for some outliers, there is no special relationship between city size (population) and mortality rates.[61]

Overall, existing evidence on the association between built environment factors and COVID-19 infection/mortality rate shows that density and city size per se are not influential factors and their impacts are mediated by other socio-economic, contextual, and behavioural factors such as income, social structure, degree of connectivity, quality and distribution patterns of urban infrastructure, and the extent of compliance with social distancing and hygiene measures.[62] For instance, while people in a poor neighbourhood of a compact city are likely to be vulnerable due to the lack of access to infrastructure, limited floor area, and the difficulties of compliance with stay home and social distancing measures, those who live in better-off neighbourhoods with better access to infrastructure and can afford staying at home during lockdown periods are less likely to be vulnerable.

In many parts of the world (both developed and developing countries), low-income areas have been hit harder by the pandemic. In New York, for example, mortality rates in low-income neighbourhoods were about two times higher than those in better-off neighbourhoods. This discrepancy could be explained by the fact that low-income households live and work in smaller spaces, making it more difficult to observe social distancing rules. In addition, their precarious livelihood conditions make it difficult for them to stay home for a long period.[63] There is ample evidence suggesting that housing inequality has made it difficult to control the spread of the pandemic in cities such as Mumbai, India. In crowded slums and informal settlements, households have limited access to adequate infrastructure, are deprived of basic services such as clean water and sanitation, and are exposed to high levels of indoor and outdoor air pollution. These conditions make them more vulnerable to infectious diseases and cause challenges for following protective measures such as social distancing and practicing good personal hygiene.

Housing inequality may become further exacerbated during pandemics or other adverse events, resulting in higher rates of unemployment and sluggish housing supply, reducing housing affordability. Accordingly, urban planners should develop policies and strategies to provide affordable housing in order to mitigate housing inequality and its potential associated risks for public health.[64]

Connectivity is another mediating factor that can play an important role. Some have argued that connectivity has

Dealing with adverse events such as the pandemic is particularly challenging in slums. A sense from Santa Marta favela in Botafogo, South Zone of Rio De Janeiro, Brazil © Shutterstock

played a larger role in the initially higher rate of pandemic spread in larger and more dense cities rather than city size or density. Such cities are often characterized by a large network of connections with other cities locally, regionally and internationally, leading to more human interactions and the spread of the virus at higher rates.[65]Accordingly, early actions to restrict mobility or taking measures to ensure safer mobility could be effective in reducing contagion risk in such dense areas.

Generally, suburban areas proved to be less resilient to adverse events due to limited accessibility to emergency and response services.[66] Similarly, the lack of healthcare and medical services in low-density suburban areas could indeed make them more vulnerable to pandemics. This hypothesis is supported by evidence showing that the mortality rate from infectious diseases such as flu is higher in suburban and rural areas than in urban areas, which offer better access to medical services and higher rates of compliance with public health measures.[67]

Housing inequality may become further exacerbated during pandemics or other adverse events, resulting in higher rates of unemployment and sluggish housing supply, reducing housing affordability

6.3.2. Re-emphasizing the need for compact urban development

Overall, urban planners should make the case that well-designed and well-managed compact cities featuring characteristics such as equitable distribution of infrastructure and services, mixed uses, walkable access to open and green spaces, and support to vulnerable residents during adverse events (e.g. economic support packages, and delivery of food and basic services) are safe and not more vulnerable than low-density suburban or rural areas.[68] Considering that certain levels of compactness are needed to support economies of scale, minimize unregulated intrusion in ecosystems, and facilitate other sustainable urban development measures such as multimodal transportation, it is imperative to regain public confidence in compact urban form.

Well-designed and well-managed compact cities are safe and not more vulnerable than low-density suburban or rural areas

Even as public health fears diminish, the accelerated trends of teleworking, decreased demand for commercial office space and less investment in urban regeneration due to potential decline in inner-city property markets are other likely threats to the future of compact cities.[69] According to global research, 65 per cent of people have been working from home, and around 50 per cent of those plan to continue remote working post-pandemic.[70] To ensure that compact cities do not lose their appeal amidst such transformations, these changing trends and potential decline in land values could be seized as an opportunity to provide affordable housing in inner-city areas.[71] However, measures should be taken to ensure such areas' economic and social vitality. As already practiced in cities like San Francisco (Box 6.5), amending zoning regulations to facilitate the flexible design of outdoor spaces, redesigning streets and open spaces in a more people-centric manner, and promoting micro-mobility options could be effective in helping compact cities emerge more liveable and affordable in the coming years.[72]

6.3.3. Sustainable neighbourhood planning and the 15-minute city

What makes a city compact are its constituent parts: neighbourhoods. Neighbourhood planning and regeneration has been a major concern for urban planners and designers

Velib shared bicycles in Paris, France © Shutterstock

since the early 20th century.[73] Indeed, neighbourhood planning has been the major focus of various urban planning concepts and movements such as garden cities, neighbourhood unit, traditional neighbourhood development, transit-oriented development, smart growth, urban village, New Urbanism, and ecological urbanism. These over 100 years of efforts have been successful in delineating the underlying principles and characteristics of sustainable neighbourhood planning and design. There is now consensus

Box 6.5: San Francisco makes four Slow Streets permanent

San Francisco launched the Slow Streets programme in April 2020 amid the pandemic, ultimately closing 31 streets to through traffic and giving residents safe spaces to walk, bike and socially distance. People living on the streets and emergency vehicles still have access. The San Francisco Municipal Transportation Agency (SFMTA) later voted to keep four Slow Streets beyond the COVID-19 emergency order, starting the process to determine which of the city's streets will permanently remain pedestrian friendly.

Multi-block stretches are the first corridors the board decided will welcome cyclists and pedestrians for the long-term. Design measures have been taken in the four streets to improve safety. Wayfinding signs and crosswalks are planned and new vehicle turn restrictions are slated to reduce through traffic, for example.

SFMTA is evaluating all Slow Streets "for a post-pandemic future" to develop a network of pedestrian- and bicyclist-friendly corridors that lasts beyond the pandemic. The process includes surveying residents who live within a quarter mile of a slow street and collecting pedestrian, bicycle and vehicle counts.

Source: Graff, 2021.

Adequate provision of green, open and public spaces; efficient design of streets and street networks; appropriate levels of density; land use mix; and social mix are elements conducive to developing neighbourhoods

that sustainable neighbourhoods should have a certain level of density, be inclusive and socially mixed, follow principles of mixed-use development, allow walkable access to daily needs, feature a well-designed network of streets and open/green spaces, promote modularity and the circular economy though integration of renewable energy technologies as well as green infrastructure systems that minimize resource consumption and facilitate recycling. Such neighbourhoods are expected to be climate resilient and offer co-benefits in terms of equity and justice.[74]

Context-specific conditions make it difficult to recommend prescriptive standards and design measures. However, there is consensus that attention to measures such as adequate provision of green, open and public spaces; efficient design of streets and street networks; appropriate levels of density; land use mix; and social mix are elements conducive to developing neighbourhoods that can contribute to addressing urbanization challenges such as inequality, congestion, biodiversity loss, urban sprawl and inefficient resource consumption.[75]

More detailed and context-specific measures and standards have been recommended in an increasing number of design frameworks and assessment tools developed to guide sustainable neighbourhood planning and design. For instance, Leadership in Energy and Environmental Design for Neighbourhood Development (LEED-ND) is a US designation that governs standards for various neighbourhood planning and design factors such as smart location and linkage, neighbourhood pattern and design, and green infrastructure and Buildings. While LEED-ND has been mainly developed to promote neighbourhood regeneration and curb urban sprawl in the United States, it has also been used in other countries that lack their own framework.[76] In addition, the Building Research Establishment Environmental Assessment Methodology (BREEAM) and the Communities and Comprehensive Assessment System for Built Environment Efficiency (CASBEE) for urban development are other widely known frameworks that originated from the United Kingdom and Japan, respectively.[77] ‘

Design standards introduced by these frameworks are context-specific and may not be applicable to all contexts without customization. While much of the future world urban population growth will occur in the cities of developing countries, they often lack their own context-specific neighbourhood design standards, which could result in undesirable neighbourhood development patterns, directed by market forces.

Despite the vast body of knowledge on sustainable neighbourhood planning principles, there is still a mismatch between the theory and practice of sustainable neighbourhood planning.[78] This mismatch has been further highlighted during the recent pandemic when in most cases, neighbourhoods failed to respond to resident needs during the mobility restriction periods. COVID-19 has, therefore, further revealed the need for better accessibility to amenities at the neighbourhood scale. In addition to mobility restrictions, during pandemics and other adverse events, lack of accessibility to essential services and amenities such as neighbourhood health centres, pharmacies and supermarkets could affect the quality of life of residents, particularly those that do not own private vehicles. The importance of neighbourhood medical centres for conducting timely primary response measures (e.g. screening) has been demonstrated in countries such as the Republic of Korea.[79] In the absence of such neighbourhood-based facilities, municipal and regional health centres could be overcrowded, as has been observed in Italy.[80] This will undermine their performance and capacity to test and treat patients. Additionally, overcrowding may lead to the further spread of the virus.[81]

Neighbourhood planning based on the principles of walkability, cyclability, accessibility, mixed use, and compactness and through integration of green infrastructure can provide multiple co-benefits for health, equity, and climate change adaptation and mitigation. The pandemic highlighted the need for walkability and access to green and open spaces. There is evidence suggesting that compact and well-designed neighbourhoods increase physical activity, thereby contributing to health improvements such as reducing obesity.[82] Urban agriculture can also provide better access to healthy food, especially in so-called “food deserts” that lack such access.[83]

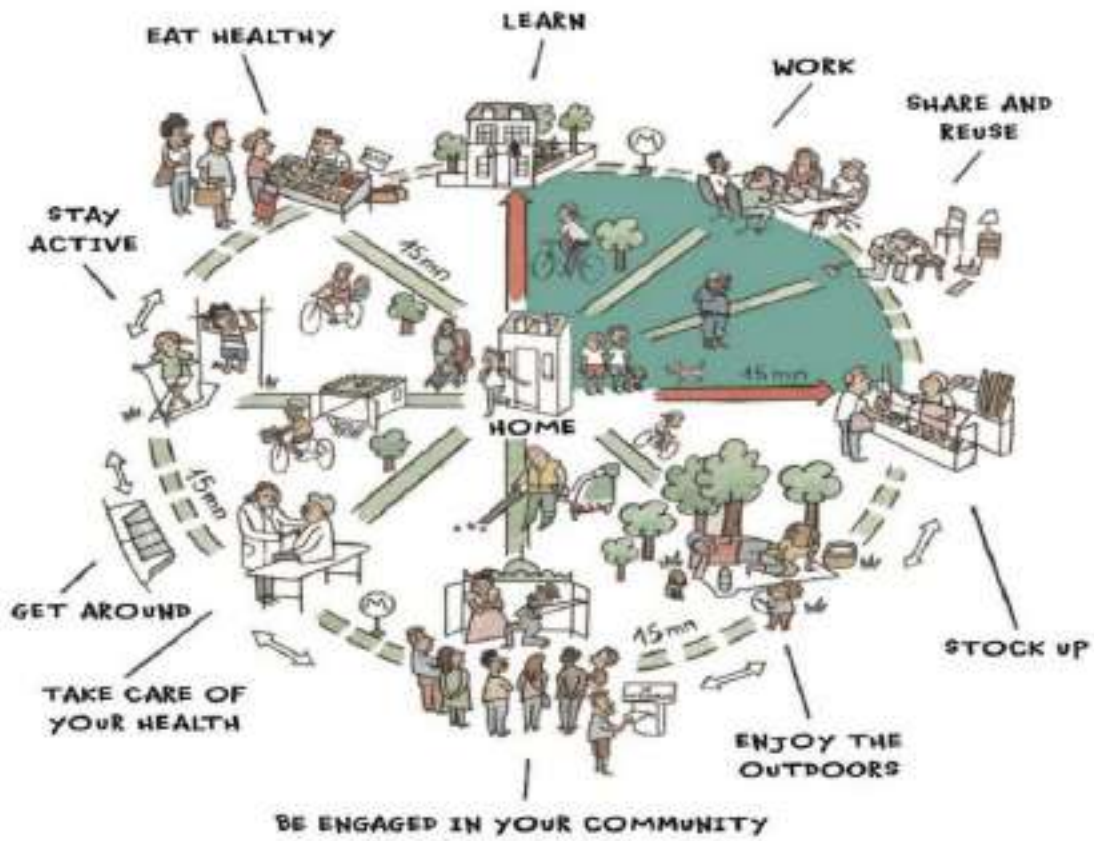
Many of the benefits of sustainable neighbourhood planning have been repackaged since 2020 under the banner of the 15-, 20- or 30-minute city. The concept, applicable to both existing and new developments, advocates for neighbourhood

design that allows residents to meet most of their daily needs within a fixed timeframe by foot or bicycle. Paris popularized the 15-minute city (Figure 6.6). Melbourne, Australia, and Portland, US aspire to the 20-minute city (Figure 6.7). Adding public transport to the mix, Sydney promotes the 30-minute city model. While the nomenclature is new, the underlying idea of a 15-, 20- or 30-minute city is not completely new and builds on previous ideas and movements described at the beginning of this section that emphasize walkable, self-contained, and mixed-used neighbourhoods that mix working, living and leisure. The 15-minute neighbourhood design allows for decentralized cities with a more polycentric structure. Such patterns enable better resilience to adverse events. For instance, centralized wholesale food markets proved ineffective during the pandemic when accessibility was limited due to mobility restrictions.[84]

Neighbourhood planning based on the principles of walkability, cyclability, accessibility, mixed use, and compactness and through integration of green infrastructure can provide multiple co-benefits for health, equity, and climate change adaptation and mitigation

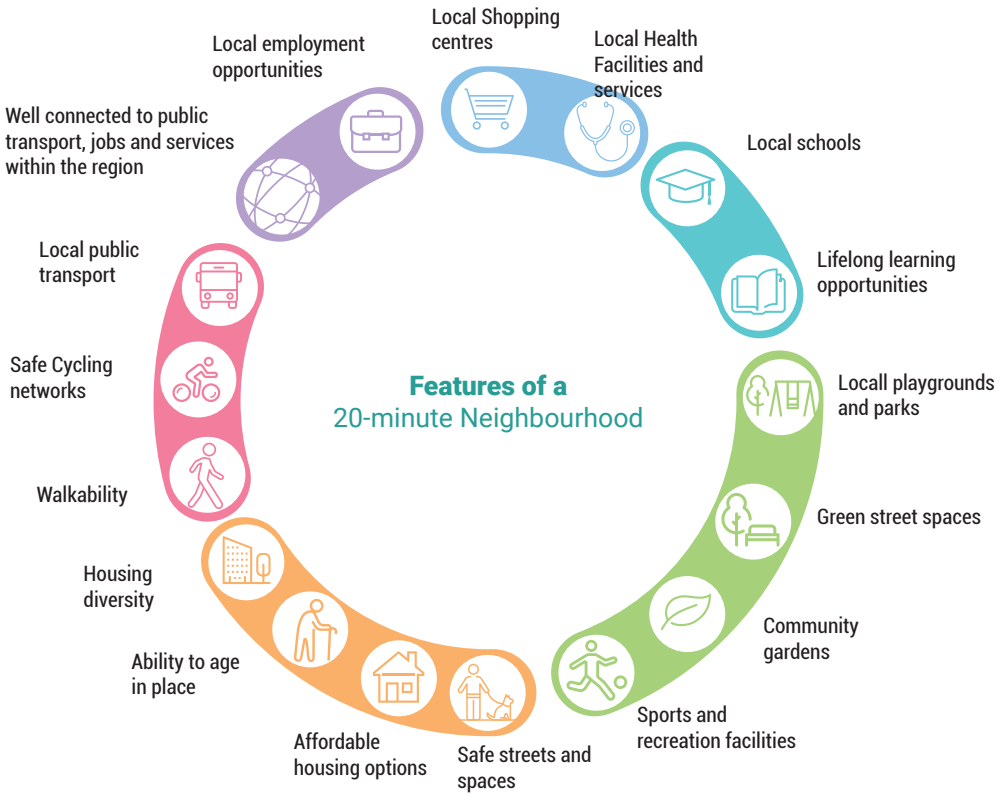
While the concept of a 15-minute city is promising, the idea is yet to be fully investigated in real-world contexts. The history of urban planning indicates that similar utopian visions like the garden city model have had limited success in solving societal issues due to their failure to consider the multiple forces that shape cities. Planners should learn from previous movements and take smart measures to ensure that 15-minute neighbourhoods do not exacerbate spatial inequalities in cities by becoming enclaves for wealthy urbanites segregated from the overall urban structure. Another important issue is that planners and policy-makers should not adopt the concept without considering the context-specific conditions of cities. Each city has unique characteristics, which should be duly considered when planning 15-minute cities.

Figure 6.6: The 15-Minute Paris



Source: Nigudkar, 2021.

Figure 6.7: Representation of the 20-minute neighbourhood in the Melbourne Plan



Source: State Government of Victoria, 2022.

6.4. Planning for the Future of Public Transport Systems

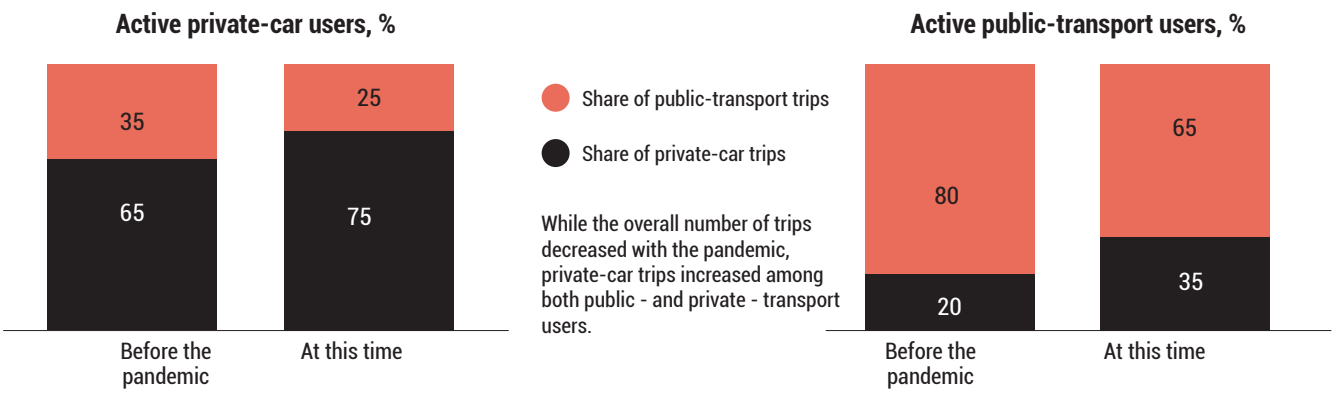
Safe and convenient access to public transportation is one of the indicators of sustainable development, as highlighted in SDG 11.2. The importance of safe, affordable, and reliable public transport systems for sustainable development and equitable participation of all social groups in urban activities has also been underlined across the New Urban Agenda. Accordingly, many efforts to promote public transportation have been made in recent years. The pandemic, however, is reshaping urban transport and, due to its impacts, mobility options are likely to be dramatically changed in the future.

6.4.1 Implications of transportation trends during the pandemic

Public transport has been recognized as an essential service during the COVID-19 pandemic as it ensured the mobility of essential workers. It helped to guarantee access to services for many people around the world. However, due to concerns over the safety of public transport and the ability of knowledge workers to work remotely, transit ridership experienced an all-time low since 2020.[85] Declines were particularly significant during the lockdown and depressed ridership figures have persisted even as restrictions have been lifted (Figure 6.8). According to the International Association of Public Transport (UITP), many governments actively discouraged the public from using public transport. This complete reversal from decades of efforts to promote public transport impacted urban mobility patterns. Evidence now shows that public transport can be "COVID-safe" when measures recommended by health departments are implemented accordingly.[86] But as public transit ridership declined, two major trends emerged. One is increased car dependency and the other, growing interest in active mobility modes such as walking and cycling.

In some countries like India, car dependency increased since the emergence of COVID-19, and people formerly interested in active and public transportation shifted towards private cars.[87] These trends show that in the absence of safe, affordable, and reliable public transportation systems, the future of urban mobility could continue to be dominated by private motorized vehicles. If this scenario emerges, it

Figure 6.8: Impacts of COVID-19 on public transit ridership between 2020 and 2021 in a 25-city research



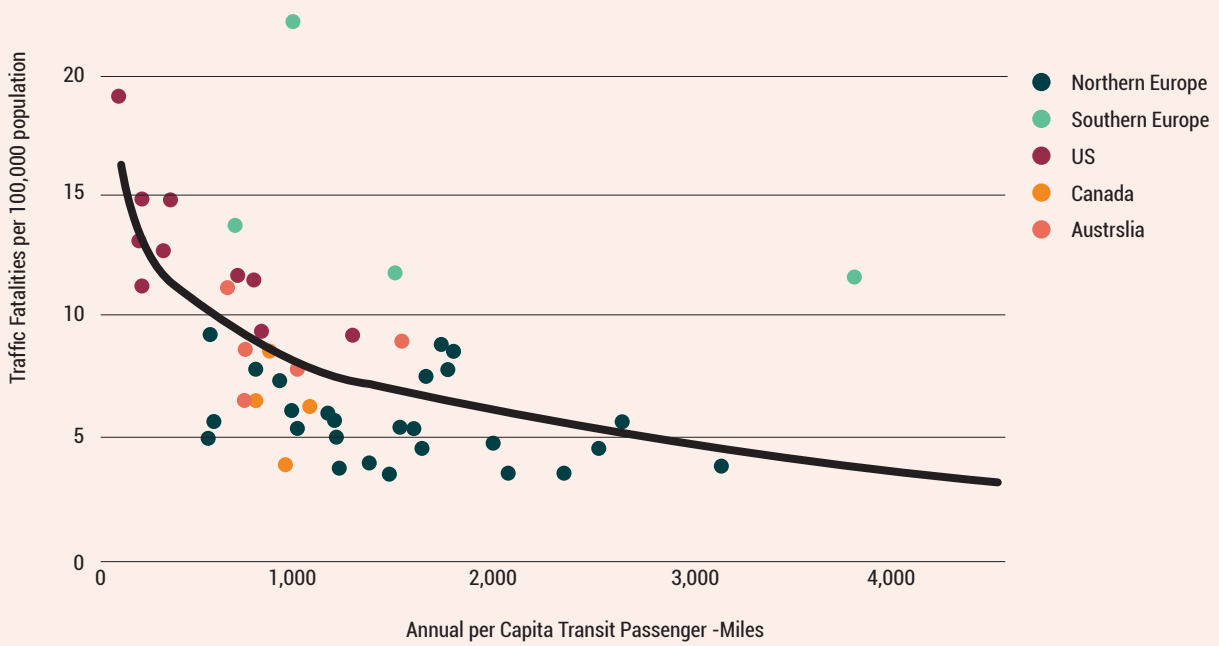
Source: Checulin et al., 2021.

will have major implications for climate change mitigation and could exacerbate already challenging issues such as air pollution, congestion, and road safety. Productivity loss due to congestion is already estimated to be about 1 per cent of global GDP.[88] Dependence on private vehicles and associated congestion also leads to other issues such as traffic accidents and health impacts associated with air pollution (Figure 6.9).[89] Evidence shows that cities with efficient and modern public transport systems are safer and have less road fatalities as compared to car-oriented cities.[90]

Figure 6.9: The link between traffic fatality rates and public transport ridership

Table 1 -In places where public transport ridership is high, traffic fatalities are low

The link between traffic fatality rates and public transport ridership is especially strng in larger cities



Source: Moglia et al., 2021

Given those statistical dynamics, sustaining public transport while ensuring walking and cycling access is vital for avoiding a spike in traffic fatalities, addressing climate emergencies, and improving equity as the urban poor may not be able to afford private vehicles. It is estimated that about 80 per cent of the total vehicle kilometres travelled are made by about 10 per cent of the global population.

About 80 per cent of the total vehicle kilometres travelled are made by about 10 per cent of the global population

Most of the world's population only rarely travel by car.[91] To retain confidence in public transport, a combination of measures is necessary such as enhancement of accessibility and reliability standards, modernization of business models and public-private partnerships for public transport operations, the introduction of tax increases on private vehicles and incentive packages for transit use, improvement of hygiene standards, and use of high-efficiency particulate air filters and better ventilation techniques.[92] While overcrowding was a recurring pre-pandemic concern on public transport, travel demand has been reduced through the adoption of flexible working arrangements that allow both teleworking and working at the office.[93]

While overcrowding was a recurring pre-pandemic concern on public transport, travel demand has been reduced through the adoption of flexible working arrangements that allow both teleworking and working at the office

The second major transportation trend brought on by the COVID-19 pandemic is increased momentum for active transportation. When urban residents were discouraged from riding public transport, many turned to walking and cycling. With less motorized traffic, urban planners responded nimbly by creating additional spaces for these activities as well as other purposes such as eating at outside restaurants in a widespread implementation of a technique known as "tactical urbanism."[94] This quick action was necessary, and cities must act fast in order to build on the momentum and drive lasting transformation in urban mobility in the post-pandemic era.

The tactical urbanism implementation modality during COVID-19, in which bicycle lanes were literally installed overnight, provides great insights on the needed response partnerships between city governments, civil society and private sector. Lima, Peru, with a high population of informal workers who make their livelihood in public spaces, established 50 km of emergency cycle lanes early in the pandemic to facilitate safe urban mobility. By late 2020, the city pushed to make the infrastructure permanent and in June 2021, the Ministry of Transport and Communication of Peru accelerated the approval of national legislation that promotes and regulates the use of the bicycle as a sustainable mode of transport.[95] In this regard, actions such as redesigning streetscapes and reallocating underutilized spaces to provide protected cycling and pedestrian lanes, promoting bicycle ownership and cycling infrastructure, and expanding smart bike-sharing programmes to facilitate synergistic benefits are recommended.[96]

When bicycles were difficult to find in stores, cities like New York with robust bike-sharing programmes saw substantial increases in use. As public transport ridership recovers, integrating bike sharing with mass transit could provide opportunities to further reduce reliance on private automobiles and taxis for last-mile connections and lead to more low-carbon transportation.[97] Evidence from Boston, US, shows that bike-sharing reduces car ownership per household by over 2 per cent, per capita vehicle miles travelled by more than 3 per cent and GHG emissions per capita by about 3 per cent.

Bike-sharing is found to be one of the most resilient transportation modes. For instance, while subway ridership has not returned to pre-COVID levels in many cities like New York, data shows that bike-sharing ridership returned to normal soon after mobility restrictions were eased.[98] However, to enhance its effectiveness, bike-sharing systems should cover all parts of cities, including low-income areas, and offer affordable pricing.[99]

As the need for private automobiles will not go away immediately, the promotion of shared mobility (car-sharing) is an effective strategy to reduce emissions. Further uptake of shared, electric and autonomous vehicles through so-called "mobility as a service" schemes are also recommended to ensure seamless connectivity, multimodality and innovation in the transport sector. Simultaneously, a shift towards renewable energy is also pivotal to reducing the sector's reliance on fossil fuels.

Integrating bike sharing with mass transit could provide opportunities to further reduce reliance on private automobiles and taxis for last-mile connections and lead to more low-carbon transportation

To enhance its effectiveness, bike-sharing systems should cover all parts of cities, including low-income areas, and offer affordable pricing

Guided by the New Urban Agenda, cities must align their transport, climate, energy and urban development plans to achieve both the Sustainable Development Goals and the Paris Agreement commitments.

Overall, there is a need for a paradigm shift toward human-centric and environmentally friendly mobility options. Currently, the transport sector accounts for about one-quarter of global energy-related CO2 emissions and air pollution kills about 7 million people annually of which a large number can be traced to pollution from vehicular traffic.[100] Road traffic accidents also kill about 1.3 million people every year.[101] The world urban population is projected to reach 6.68 billion by 2050, up from 4.2 billion in 2018. If private vehicles fuelled by non-renewable energy sources remain the dominant mode of transportation by then, the number of cars on streets is likely to reach about 2 billion vehicles,[102] with significant implications for socioeconomic and environmental sustainability and climate change mitigation.

To avoid this scenario and accelerate the transition of sustainable urban transport, future mobility options should move away from the private car and rather focus on a strong multimodal public transport system that comprises good facilities for walking and cycling and share mobility options. The increased environmental awareness and interest in active transportation driven by the pandemic along with advances in technologies that provide alternative mobility options such as smart bike-sharing, or shared and electric mobility, or mobility as a service (MaaS), provide opportunities to lure people away from reliance on private automobiles and towards active transportation, shared mobility and public transit.[103]

6.4.2. Sustainable Urban Mobility Plans (SUMPs)

To achieve these goals, cities can adopt sustainable urban mobility plans (SUMPs) to guide short- and long-term mobility planning and involve stakeholders in the process.[104]

Future mobility options should move away from the private car and rather focus on a strong multimodal public transport system that comprises good facilities for walking and cycling and share mobility options

They are widely used by local authorities to access funding in India, Brazil and France. *Sustainable urban mobility planning, specifically, is a strategic approach to transport planning that focuses on the mobility needs of people and businesses in cities following three principles: integration, participation and evaluation.*[105] *Municipal governments use SUMPs to shift investments from infrastructure development prioritizing people's and businesses' mobility needs. SUMPs help prioritize low-cost measures alongside capital-intensive projects in plans suited to the specific urban needs of each city. SUMPs may also be practical tools to align urban goals with those set up at the regional and national levels.*

The main objectives of SUMPs are to ensure access to transport services for all, improve safety and security, reduce pollution and energy consumption, improve efficiency and cost-effectiveness of the transport system and contribute to the attractiveness and quality of the urban environment.[106] The emphasis of SUMPs is on interdisciplinary dialogues that enable participation in transport decisions, expanding the range of long-term goals of transport planning, and incorporating key challenges such as wellbeing, nature conservation, and equity (Figure 6.10).

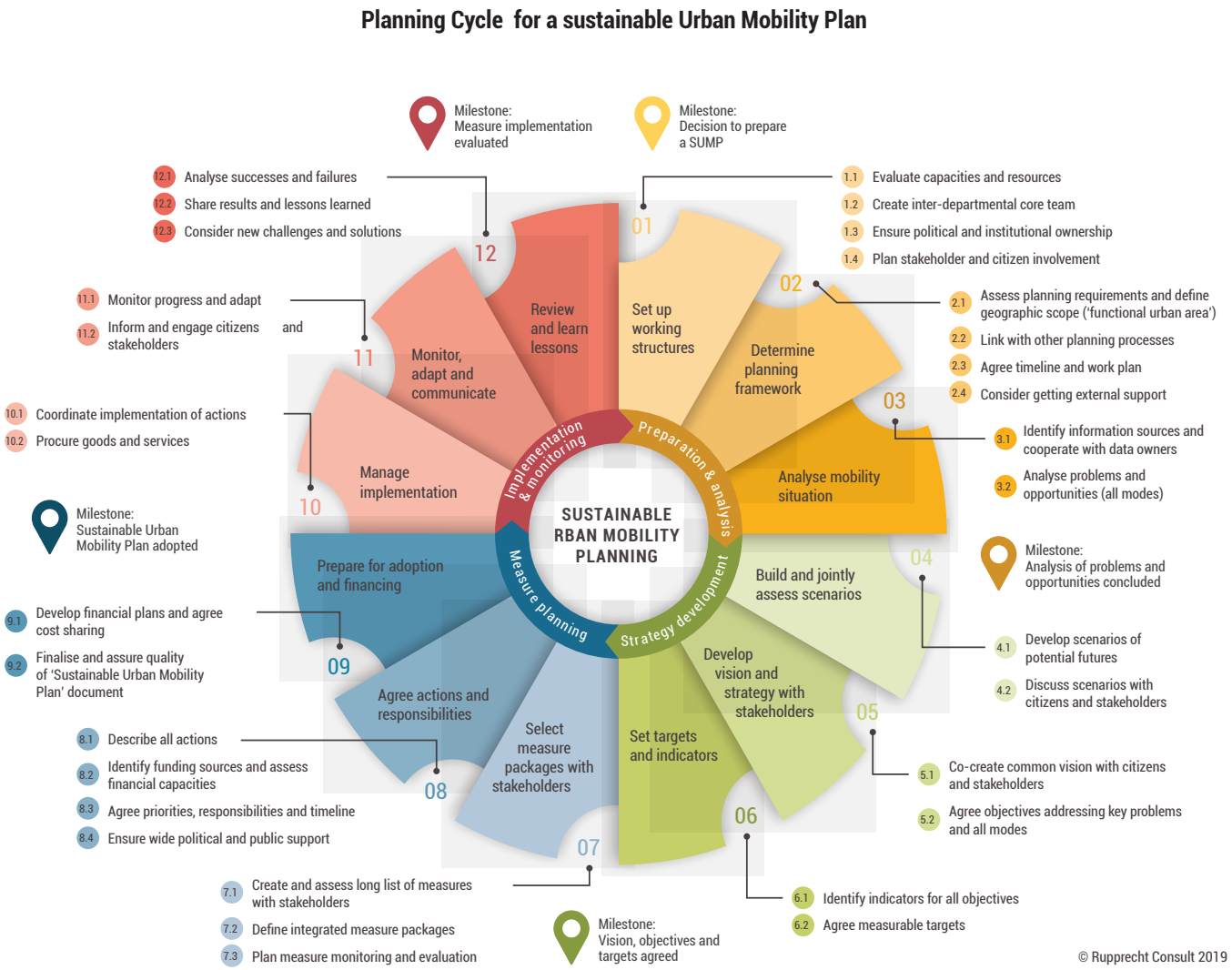
SUMPs benefit from quantitative and qualitative information on responses to modifications in transport supply and demand,[107] user preferences, mobility needs and existing practices. User surveys and focus groups to collect data also serve as engagement exercises, helping a wide range of stakeholders inform SUMPs. Scenario planning processes integrate information and support the development of planning strategies. The main challenges are ensuring disaggregated data collection that includes data on different groups' mobility needs and practices, developing scenario validation methods, and facilitating the participation of a broad set of stakeholders.[108]

6.4.3. Avoid-Shift-Improve

The Avoid-Shift-Improve (ASI) framework summarizes general practical lessons from experiences on sustainable urban mobility. The ASI framework focuses on three interventions:

- AVOID: disincentivize polluting private vehicles and unnecessary trips
- SHIFT: encourage active travel, shared mobility, or public transport
- IMPROVE: facilitate technological and institutional improvements in the current system

Figure 6.10: Sustainable Urban Mobility Planning

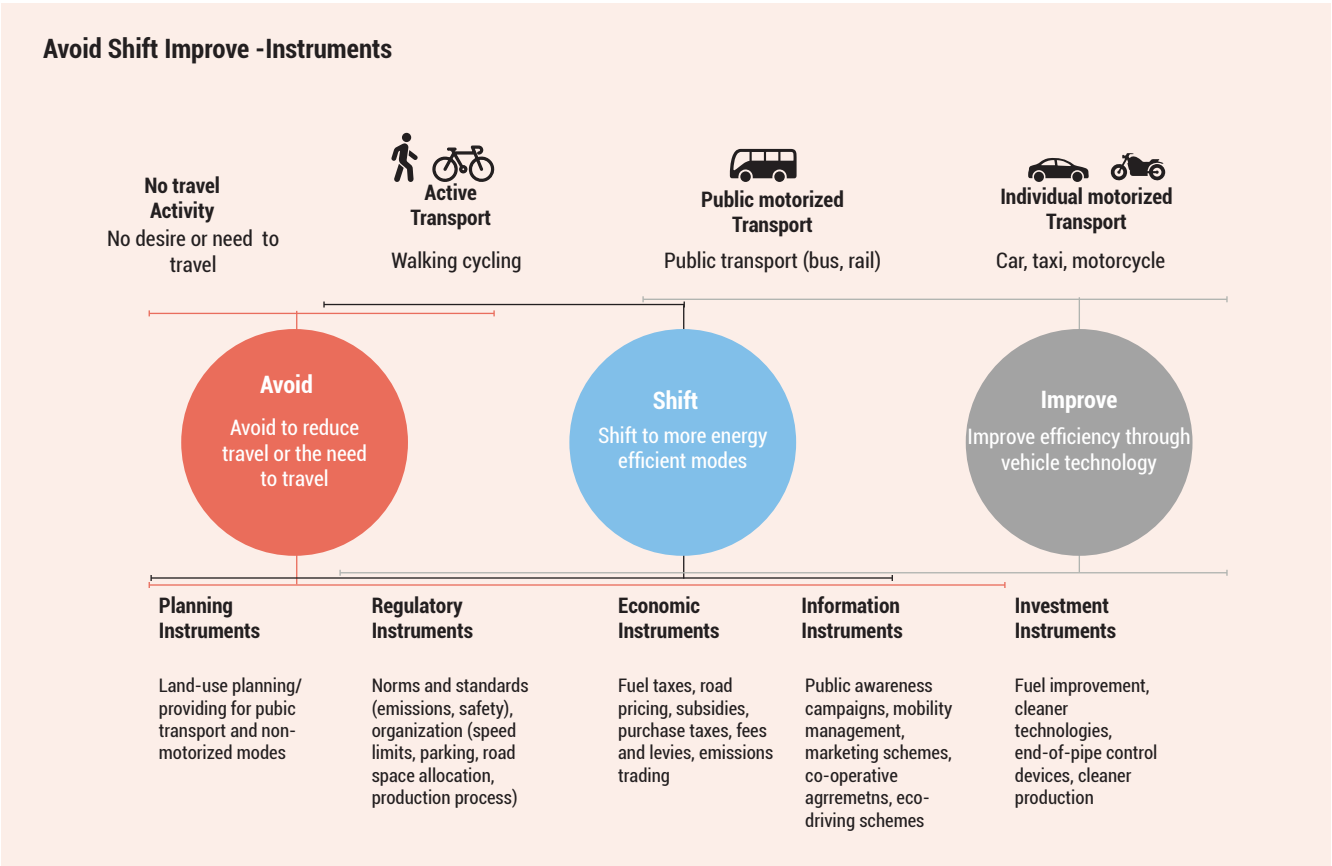


Source: Rupprecht Consult, 2019.

A detailed analysis of the impacts of each action is also needed. For example, a shift in public transport may have different components, including low-carbon public transport using waterways, electrified road or rail infrastructure, and bikes for local deliveries. The COVID-19 pandemic has called for rethinking the future of public transportation as more people have turned to more remote activity and less travel. Where shifts are not possible in the short term, improving existing options may be the most immediate answer for decarbonization, for example, investing in electric vehicles. However, changing technologies alone will be insufficient to achieve net-zero without significant impacts on people's well-being and mobility needs. As the framework shows, Avoid and Shift measures may have lower costs and a range of positive co-benefits (Figure 6.11).[109]

Urban planning can mobilize transport planning tools such as congestion charging, road closure, transport provision, creation of cycles lanes and pedestrianization. Land use and urban form are essential elements that enable or hinder the possibilities for sustainable transport and mobility.[110] In its 2013 report Planning and Design for Sustainable Urban Mobility: Global Report on Human Settlements, UN-Habitat advocated for a "conceptual leap" in transport planning: Rather than focusing on extending infrastructure and encouraging people's movements over long distances,

Figure 6.11: Examples of instruments under an Avoid/Shift/Improve framework



Source: Transformative Urban Mobility Initiative (TUMI), 2019.

the report argued for bringing people, places, and activities closer together. These ideas are not new but have regained traction in proposals to facilitate the recovery from the COVID-19 pandemic.[111] The Avoid-Shift-Improve framework exemplifies the need to move beyond specific tools, to integrate action across policy domains and facilitate placemaking interventions that support the integration of different activities in proximity (housing, employment, education, leisure and entertainment) and reduce the need to travel.

6.5. The Importance of Spatial Scales and Analysis for the Future of Urban Planning

Cities do not exist in isolation. In addition to being connected to the global markets, they have strong ties with their hinterland areas. They are always dependent on other cities and rural areas in their hinterland to provide urban services and commodities and multiple types of ecosystem services. Accordingly, trade, species, humans, and other actors and elements constantly flow in and out of cities in dynamic and non-linear patterns. Further, urban agglomerations, where several cities are closely interrelated and function as integrated economies, are common in many parts of the world.[112] The high density of internal connections between cities in such agglomerations provides multiple benefits for establishing a strong local economy.

However, such high connectivity levels may have implications for resilience as shocks and disruptions in one part of the system could rapidly spread to the other parts. For instance, water contamination at the point source in rural areas can have major implications for urban residents living in downstream locations;[113] or, loss of connectivity between cities and their hinterland areas could lead to supply chain disruption. Accordingly, since the urban-rural interface is highly interconnected, planning processes for urban and rural areas should not occur in isolation from one another. Urban planning should instead consider issues that cross official municipal boundaries.[114]

6.5.1. Urban-rural interlinkages and pandemics

International policy frameworks like the SDGs and NUA emphasize the need for multi-level governance, regional coordination and integrated approaches that acknowledge interactions between urban, peri-urban, and rural areas. Despite these frameworks, urban-rural interlinkages are often overlooked in urban planning and decision-making practices. This oversight has resulted in major problems such as degrading ecosystem services and encroachment on natural habitats.

Urban-rural interlinkages are often overlooked in urban planning and decision-making practices

Unregulated peri-urban development that increases human interaction with other species may increase zoonotic diseases through virologic mutation, as observed in many rapidly urbanizing countries of Asia, such as China and Vietnam.[115] Virologists have argued that the convergence of three processes, namely, urbanization, agricultural intensification and habitat alteration has increased the emergence and spread of infectious diseases. For instance, evidence suggests links between emerging infectious diseases and rapid urbanization in China and other rapidly urbanizing developing countries. In other words, rapid urbanization has triggered and accelerated the spread of infectious diseases. It is estimated that about half of zoonotic diseases that emerged since 1940 could be linked to periods of major forest loss and habitat encroachment.[116]

In rapidly urbanizing contexts that are going through land use transition in peri-urban areas (from agricultural to urban), effective siting decisions need to be made to, in addition to minimizing negative impacts on natural ecosystems, regulate the human-livestock interface and ensure their comingling does not lead to "host-jumping and pathogen spread among humans."[117] In addition to mitigating environmental impacts, regional interventions that manage and regulate urbanization, agricultural intensification and habitat alteration processes through land-use planning and spatial planning can reduce the risk of human exposure to zoonotic agents, thereby facilitating more effective control of virus transmission and contagion risks. Regional planning approaches allow planning to play its role as a preventative tool (in contrast to biomedical approaches that are mainly focused on responses).[118]

Unregulated peri-urban development that increases human interaction with other species may increase zoonotic diseases through virologic mutation

Adopting a regional and territorial approach means acknowledging that cities are socio-ecological systems, and their management requires integrated approaches instead of silo-based ones.[119] For this purpose, in some contexts, regional and territorial planning has been utilized.[120] However, the current planning systems based on political or administrative boundaries often do not lend themselves to the proper consideration of dynamic interactions between urban and rural settlements that are nested within an integrated spatial network. It is, therefore, suggested that planning system boundaries should be determined based on community and/or functional criteria. While defining functional boundaries could be challenging in some contexts due to data limitations, readily available data from satellite imagery and population grids can be used to develop standardized methods for defining functional boundaries.[121]

Adopting a regional and territorial approach means acknowledging that cities are socio-ecological systems, and their management requires integrated approaches instead of silo-based ones

Ensuring proper planning in such a functionally-defined system requires adopting a multi-level governance system that can coordinate activities across different types of human settlements.[122] Instead of fragmented systems where each city operates in isolation, in integrated governance systems, networks of cities are formed, and dynamics and impacts beyond individual municipal boundaries are taken into account in planning and decision-making processes. Multi-level governance that facilitates cooperation across scales also contributes to achieving the New Urban Agenda's objectives and enhances socio-economic and environmental values of sustainable urbanization, as is explained in the World Cities Report 2020.[123]

6.5.2. Food systems and resilience

While multi-level governance involves multiple issues, the food supply chain offers a tangible example. The issue of food security and cities' dependence on their hinterland provides a strong justification for promoting multi-level governance systems. While cities can meet part of their food needs through urban agriculture, they will remain dependent on their peri-urban and rural areas and international supply chains to ensure food security. Adverse events such as

While cities can meet part of their food needs through urban agriculture, they will remain dependent on their peri-urban and rural areas and international supply chains to ensure food security

pandemics can result in food insecurity in cities due to food processing, distribution and delivery disruptions. Multi-level governance at the regional scale is needed to respond to such disruptions and engage multiple actors and stakeholders in planning for better regional resilience. Such multi-level governance will ensure improved management of interlinkages and interdependencies among different settlements in a city-region.[124]

Based on the principles of multi-level regional planning and governance, the Food and Agriculture Organization (FAO) has proposed the City-Region Food Systems (CRFS) approach that provides opportunities to address challenges "inherent to the industrial capital-driven food system" that can result in supply chain disruptions and food insecurity during adverse events (Figure 6.12).[125] Key features of CRFS are its abilities to strike a balance between regional dependency and local self-sufficiency (Box 6.5) and to foster and strengthen collaboration among different local governments and stakeholders.[126] Having collaborative networks is critical for community resilience against different shocks, including pandemics. CRFS also provides multiple benefits for sustainability. It contributes to enhancing availability and accessibility to quality locally grown food, thereby providing health benefits; helps protect the ecosystem by nurturing soil and improving watershed management; strengthens the local economy by increasing money recirculation with the region; and increases social capital by providing more opportunities for interactions and collaboration between different stakeholders.[127]

Overall, for cities to be more resilient against pandemics and other threats, multi-level governance approaches and coordinated policies and actions across different scales and sectors are needed. Such approaches facilitate better management of the transitional spaces between urban and rural areas and can enhance efficiency, minimize conflicts and trade-offs, and maximize co-benefits and synergies between different measures and strategies.

Figure 6.12: The City-Region Food Systems (CRFS) approach

Source: FAO, 2022.

Box 6.6: Harambee urban farms fill a crucial void for Black, Latinx families during the pandemic

When COVID-19 began developing in 2020, Victory Garden Initiative, an urban farm in the Harambee neighbourhood, Milwaukee, US, pivoted. The 1.5-acre farm nestled between Concordia Avenue and Townsend Street went from being for members only to allowing access to anyone who wants fresh vegetables that are grown on the site. It has operated as a community-supported agriculture farm since 2017 when the initiative acquired the land. People pay a yearly fee to receive a share or box of the farm's harvest. Urban gardens or farms like Victory Garden Initiative have increasingly stepped up to fill the food access void, providing fresh fruits and vegetables during the pandemic. They've become pivotal in countering food insecurity, especially of Black and Latinx families.

Source: Lynch, 2021.

6.6. Concluding Remarks and Lessons for Policy

The COVID-19 pandemic could be a catalyst for major transformations in cities. Indeed, cities have often survived adverse events throughout history and developed innovative solutions to recover stronger. Therefore, while the pandemic has raised serious questions about the sustainability and resilience of cities, it has also provided multiple insights for reflection on the way forward as summarized below:

- The most important lesson is that current urban development patterns are unsustainable in numerous ways. The pandemic revealed that major transformations in the energy and transportation sectors are needed to achieve deep decarbonization, which is essential for dealing with climate change, a pressing challenge looming over cities.

- There is an urgent need for stimulus and recovery plans that ensure both socio-economic recovery and alignment with climate targets. Further investments in green and renewable technologies and solutions across all sectors, especially energy and transport, are needed. Such recovery efforts should be inclusive to minimize societal inequalities that are blamed for disproportional impacts of adverse events such as pandemics and climate-induced disasters on different social groupings in our cities.

- It is essential to retrofit and redesign urban infrastructure, both indoor and outdoor, to enhance its resilience to pandemics and crises. The COVID-19 pandemic has shown the need for multi-purpose and flexible spaces that can adapt to new scenarios, which is a major shift from traditional urban planning practices like single-use zoning that often overlook flexibility and adaptability.

- Compact development remains crucial for supporting economies of scale, minimizing unregulated intrusion in ecosystems, and facilitating other sustainable urban development measures such as creating cities of short distances such as sustainable neighbourhood planning, 15-minute and 20-minute cities. Well-designed and well-managed compact cities with equitable distribution of infrastructure and services, mixed uses, walkable access to open and green spaces, and support to vulnerable residents during adverse events (e.g. economic support packages, and delivery of food and basic services) are safe and resilient to pandemics.

- There is a need to reduce car dependence and continue efforts to promote sustainable public transport and active mobility. There are tools that are readily available such as the Sustainable Urban Mobility Plans (SUMPs) and Avoid-Shift-Improve (A-S-I). Additionally, integrated transportation policies are needed to establish seamless connections between public transportation and walking/cycling networks. In combination with measures aimed at increasing shared mobility and enhancing the safety and affordability of public transportation, such policies could effectively reduce car dependence in cities.

- Urban and territorial planning should be enhanced to include a keener focus on urban-rural and food system interlinkages. Cities do not exist in isolation and planning efforts should reflect this.

Endnotes

1. United Nations Department of Economic and Social Affairs, 2019.
2. Seto et al., 2013.
3. OECD and European Commission, 2020.
4. Sharifi and Khavarian-Garmsir, 2020.
5. UN-Habitat, 2016a.
6. la Greca et al., 2020.
7. Fezi, 2020.
8. Sharifi and Khavarian-Garmsir, 2020.
9. Sharifi et al., 2021.
10. Åberg and Tondelli, 2021; Sapra and Nayak, 2021.
11. Campbell, 2018.
12. Venter et al., 2020.
13. Sharifi, 2021.
14. Sharifi and Khavarian-Garmsir, 2020.
15. UNEP, 2021e.
16. UNEP, 2020b.
17. Sharifi and Khavarian-Garmsir, 2020.
18. Klenert et al., 2020.
19. UN-Habitat, 2021a.
20. Martínez and Short, 2021; UNEP, 2021.
21. UN-Habitat and Global Utmaning, 2021.
22. Wade, 2020.
23. United Nations Department of Economic and Social Affairs, 2019.
24. Biswas P.P., 2020.
25. Moglia et al., 2021.
26. UN-Habitat and Global Utmaning, 2021.
27. Zhuang et al., 2021.
28. Martínez and Short, 2021.
29. Honey-Rosés et al., 2020.
30. Alexandri and Janoschka, 2020.
31. Sapra and Nayak, 2021.
32. Gallent and Madeddu, 2021.
33. Bayulken et al., 2021.
34. Balling et al., 2021.
35. Ferdous, 2021.
36. Gallent and Madeddu, 202
37. Gallent and Madeddu, 202
38. Hall and Vidén, 2005
39. Kang et al., 2020.
40. UN-Habitat, 2021a.
41. Fezi, 2020.
42. Fezi, 2020.
43. Paköz et al., 2021.
44. Fezi, 2020.
45. Alexandri and Janoschka, 2020.
46. Pouso et al., 2021.
47. de Lannoy et al., 2020..
48. Devine-Wright et al., 2020.
49. Fang et al., 2020.
50. Silva, 2016.
51. UN-Habitat, 2021a.
52. Bayulken et al., 2021.
53. Firth et al., 2021.
54. Firth et al., 2021.
55. Sharifi, 2019.
56. Sharifi, 2019.
57. Gallent and Madeddu, 2021; Kakderi et al., 2021; Sapra and Nayak, 2021.
58. Fezi, 2020.
59. Lak et al., 2021; Rivera-Córdova, 2021; You et al., 2020.
60. Boterman, 2020; Federgruen and Naha, 2021; Khavarian-Garmsir et al., 2021.
61. UN-Habitat, 2021a.
62. Sharifi and Khavarian-Garmsir, 2020.
63. Kang et al., 2020.
64. Kang et al., 2020.
65. UN-Habitat, 2021a.
66. Sharifi, 2019.
67. Hamidi et al., 2020; Kang et al., 2020; Magallón-Botaya et al., 2021.
68. Sharifi and Khavarian-Garmsir, 2020; UN-Habitat, 2021a.
69. Lai S. et al., 2020.
70. Saint, 2021.
71. Chernick et al., 2020.
72. Kakderi et al., 2021.
73. Sharifi, 2016.
74. Moreno et al., 2021; Sharifi, 2016.
75. Sharifi, 2016; UN-Habitat, 2015a.
76. Sharifi and Murayama, 2013.
77. Sharifi and Murayama, 2013.
78. Sharifi, 2016.
79. Kang et al., 2020.
80. Odone et al., 2020.
81. Kang et al., 2020.
82. Sallis et al., 2020.
83. Sallis and Glanz, 2009.
84. Blay-Palmer et al., 2021.
85. Shokouhyar et al., 2021.
86. UITP, 2020b.
87. Thombre and Agarwal, 2021.
88. Moglia et al., 2021.
89. Moglia et al., 2021.
90. UITP, 2020a.
91. Sims et al., 2014.
92. Fezi, 2020.
93. Barbarossa, 2020; Bojovic et al., 2020; Hörcher et al., 2021.
94. Martínez and Short, 2021.
95. Cities4Health, 2020.
96. Moglia et al., 2021.
97. Pase et al., 2020.
98. Wang and Noland, 2021.
99. Pase et al., 2020.
100. IPCC, 2014b.
101. WHO, 2021f.
102. IPCC, 2014b.
103. Ceder, 2021.
104. GIZ, 2014.
105. Eltis, 2021.
106. European Cyclists' Federation, 2020.
107. Okraszewska et al, 2018.
108. Eltis, 2021.
109. Liimatainen et al, 2018; Steg and Gifford, 2005.
110. Steg and Gifford, 2005.
111. UN-Habitat, 2013.
112. Angel and Blei, 2020.
113. Bhowmick et al., 2020.
114. UN-Habitat, 2021a.
115. Spencer et al., 2022.
116. Azevedo et al., 2020; UN-Habitat, 2021a.
117. Spencer et al., 2022.
118. Spencer et al., 2022.
119. Murgante et al., 2020.
120. Gruehn, 2017; Todes, 2004.
121. Angel and Blei, 2020; OECD and European Commission, 2020.
122. Angel and Blei, 2020.
123. UN-Habitat, 2020a.
124. Sukhwani et al., 2020.
125. Blay-Palmer et al., 2021.
126. Blay-Palmer et al., 2021.
127. Blay-Palmer et al., 2021.

Chapter 7:

Public Health and Sustainable Urban Futures

Quick facts

1. Climate change has overtaken disease as the foremost urban health threat and risks leading to the high damage urban future scenario.

2. The causes of mortality and ill health in cities have shifted significantly in the past 20 years with the rising toll of Non-Communicable Diseases (NCDs) in both low-income and higher-income cities.

3. COVID-19 amplified cities' entrenched health inequities with racial/ethnic minorities, women, displaced populations, residents of informal settlements, precarious workers, and other marginalized groups disproportionately affected.

4. Rising levels of depression, anxiety and other mental health impacts have been linked to COVID-19, particularly for essential workers, those with heightened caring duties (especially women), racial/ethnic minorities and other vulnerable groups.

5. In six of the most disruptive conflicts currently waging in the world today, major cities have been active battlegrounds leading to immediate and long-term devastating impacts on urban health and future development.

Policy points

1. When health is recognized and acted upon as a priority across all urban interventions, there are vital possibilities to achieve multiple benefits for well-being and foster inclusive, resilient, and sustainable urban futures.

2. Ongoing disaggregated data collection is essential to reveal the true picture of multi-layered rapidly changing urban health risks for effective policy formulation and action to ensure policymakers "leave no one behind."

3. Challenges of health inequity—often rooted in geographic, political and socioeconomic exclusion—can be tackled via place-based initiatives co-developed with residents to promote health in marginalized neighbourhoods and support more equitable urban futures.

4. Expanding Universal Health Care is a key priority in advancing health for inclusive, resilient, and sustainable urban futures as well as strengthening health system preparedness for a future of epidemics and pandemics.

5. Responsive, accountable local governments play a pivotal role in developing effective holistic place—based interventions that can generate multiple co-benefits for health, inclusion and climate change mitigation.

Health in all its multifaceted dimensions has surged to the forefront of public dialogue, especially discussions of cities, in the last two years. But the reinvigorated movement for healthy cities to achieve the optimistic urban future scenario urgently needs multisectoral approaches extending far beyond the health sector. Such wide-ranging approaches are necessary because health is an essential component of sustainable urbanization given its impact on and interrelation with social, economic and environmental factors. Rather than existing as a standalone priority, health can serve as a catalyst that unifies several SDGs and generates multiple far-reaching benefits beyond the absence of disease.

Indeed, health should not be so narrowly understood. The Constitution of the World Health Organization (WHO) defines "health" broadly as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."[1] More recently, WHO has championed the "healthy cities" global movement to inform city governments of the important role of social, spatial and physical factors in supporting health and well-being for all.[2] The approach also emphasizes the pivotal overarching role of responsive, accountable local governance in supporting social determinants of health including fostering safety, promoting social cohesion, enhancing living conditions and creating access to decent work.[3]

Improved access to healthcare; water, sanitation, and hygiene (WASH); and other health-promoting infrastructure and services are the necessary minimum components to support well-being in urban areas. However, in the wake of present-day challenges, health interventions for sustainable urban futures will need to incorporate considerations of climate change, which poses the foremost contemporary urban health threat.[4] Climate-related health impacts will need to be addressed across several sectors and levels, including at the home, workplace, neighbourhood, city, metropolitan and regional scales.

Analyses of rural and urban health data have often suggested there are better health outcomes in urban areas and that urban residents typically "enjoy better health on average than their rural counterparts."[5] However, when household wealth is taken into account, the "urban advantage" in health often disappears.[6] Based on recent data on children's survival and well-being from 77 low- and middle-income countries, the "poorest and most vulnerable urban children fare worse than their peers in rural areas."[7]

More generally, in many urban centres, the same health risks are experienced and acted upon in starkly different ways due to racial divides, gendered discrimination, xenophobia and other sources of disadvantage. Known as "health inequities," such differences in health outcomes are "not only unnecessary and avoidable, but in addition, are considered unfair and unjust."[8]

Improved understanding of how multiple factors contribute to urban health disparities at several levels and sites (including homes, workplaces and neighbourhoods) will be key to effective interventions that can avoid entrenching urban health inequities. Additionally, there is a crucial need for ongoing, disaggregated data collection to understand and address urban health inequalities. Findings on health risks by residents themselves (so-called "citizen scientists"), including those in informal settlements, can help fill data gaps while also informing effective, equitable interventions.

The COVID-19 pandemic exacerbated cities' profound health inequalities, with racial/ethnic minorities, women, people with disabilities, residents of informal settlements, precarious workers and other marginalized groups bearing an especially heavy toll.[9] In the wake of COVID-19, it will be essential to develop strategies that promote healthy urban futures while also fostering climate resilience, social inclusion and more inclusive development pathways in order to avoid the high damage urban future scenario.[10] Promoting health for sustainable urban futures will require a holistic multisectoral approach to address the interrelated social, economic, political, and environmental factors influencing health in cities. Such interventions can simultaneously address the complex set of determinants of urban health as well as generate co-benefits toward these goals.

This chapter will therefore focus on opportunities for generating multiple co-benefits for health, inclusion and climate change mitigation by placing health at the core of urban interventions. This requires a holistic understanding of the factors influencing health in cities as well as addressing the roots of health inequities. The question guiding the chapter is: How can cities effectively promote and secure health for inclusive, resilient, and sustainable urban futures?

Section 7.1 illustrates the multilayered, rapidly changing nature of urban health risks and analyses data on the shifting causes of mortality in urban areas. The section also examines how health outcomes can vary markedly based on race, gender, disability, income levels, residence and other differences within and between cities. It also discusses the intersectional nature of urban health inequalities and the necessity of developing inclusive, contextually rooted strategies.

Section 7.2 considers recent innovative strategies for addressing urban health inequities. The section presents place-based interventions being implemented in cities across the world that are fostering equitable health and well-being such as telemedicine, "citizen science", partnerships with civil society organizations, and urban redesign.

While health equity - promoting initiatives are necessarily place-specific, the forward-looking section 7.3 reflects on the overarching vision to create healthy cities and thus generate inclusive, resilient and sustainable urban futures. The section identifies nine interrelated priorities: 1) the "health in all policies" approach; 2) ongoing, disaggregated data collection 3) developing holistic, place-based strategies; 4) pursuing climate and health co-benefits; 5) enhancing universal health coverage and complementary social programmes; 6) strengthening health system preparedness; 7) supporting healthy diets and active lifestyles; 8) enhancing health at the workplace; and 9) promoting mental health. The chapter concludes in section 7.4 with five lessons for policy to promote and secure health for inclusive, resilient and sustainable urban futures.

7.1. Towards a Multilayered, Intersectional Understanding of Urban Health

This section elaborates the multilayered, rapidly changing nature of urban health risks and highlights how disadvantages linked to race, gender, disability, income levels, residence and other differences in urban areas generate intersectional inequalities. To improve urban health effectively, policymakers will require ongoing, disaggregated data collection with attention to emerging inequalities and the diversity of the urban context.

While the text will discuss recent data on urban health risks, there are inevitably major gaps in our understanding (especially in cities located in low- and middle-income countries and for vulnerable groups) that remain a priority for future research and interventions.

7.1.1 The multilayered nature of urban health risks

Long before the appearance of COVID-19, the world was already on track to a pessimistic urban future scenario for health. Studies had already confirmed how land-use change, extraction activities and migration altered and fragmented natural habitats, thus broadening the interface for human-wildlife interactions and increasing the chances of novel infectious diseases.[11] The negative impacts of climate change on the interface between natural and human habitats is linked to zoonotic diseases that pass from animals to humans, such as COVID-19, Ebola, bird flu, H1N1 flu, Middle East respiratory syndrome (MERS), SARS and Zika. This has led to a situation where one new infectious disease appears in humans every four months.[12] While HIV/AIDS is not a zoonosis, it remains a key concern in cities globally (Box 7.1). Cities are often where HIV/AIDS prevalence rates are highest despite better services and active civil society organizations addressing the epidemic.[13]

Even as the world was preoccupied with the COVID-19 pandemic, several outbreaks of the Ebola virus were reported in the Democratic Republic of the Congo and Guinea; major outbreaks of cholera struck Bangladesh, Yemen, Haiti, Niger and Nigeria in 2021;[14] and Chikungunya and dengue epidemics were confirmed in the Americas, Africa, Asia, Europe and Oceania.[15] While COVID-19 recently heightened public health awareness, the spread of communicable diseases within unhygienic conditions has long been proven historically, with those living in close contact to domestic animals and without access to running water and separate toilet facilities at heightened risk of infection.

While disease has historically been the foremost urban health threat, the 20th century saw public health improvements that dramatically reduced disease risk and increased life expectancy. Climate change is now the foremost urban health threat leading to the high damage urban future scenario due to more frequent, intense and longer-lasting extreme weather events, particularly floods and heatwaves among

Stay home banner during Vovid 19 Lockdown in Cape Town, South Africa. © Micha Serraf/ Shutterstock

Box 7.1: HIV/AIDS epidemic statistics as of 2020

Globally, approximately 37.7 million people were living with HIV in 2020. Of them, 27.5 million were accessing antiretroviral treatment. Some 680,000 people died from AIDS-related illness in 2020. There are notable regional differences of people living with HIV/AIDS. In sub-Saharan Africa, as many as 63 per cent of all new HIV infections in 2020 were amongst women and girls.

By contrast, outside of sub-Saharan Africa, 93 per cent of new infections occurred among key populations – such as sex workers and their clients; gay men and other men who have sex with men; and transgender people – who together accounted for 65 per cent of HIV infections globally.

Rates of HIV/AIDS are often elevated amongst marginalized groups such as racial/ethnic minorities, migrants and intravenous drug users.

Source: UNAIDS, 2021.

other disasters.[16] These climate related risks translate to several significant urban health burdens that vary regionally and within cities (Chapter 5).

Climate change is already having major impacts on cities' WASH provision and food security via more intense, severe or frequent flooding and droughts. Many coastal or low-lying cities are faced with rising sea levels and more intense flooding due to climate change.[17] Flooding risks can be exacerbated

Climate change is now the foremost urban health threat leading to the high damage urban future scenario due to more frequent, intense and longer-lasting extreme weather events

by shortfalls in drainage, poor solid waste management and lack of all-weather roads.[18] In turn, urban floods may result in rising levels of waterborne illness; escalating food prices and food insecurity; injuries, mortality, displacement and lost livelihoods amongst affected residents as well as broader economic burdens.[19] With further impacts on health and livelihoods, climate change is contributing to droughts and urban water insecurity while interacting with population pressures, water governance challenges and competing water uses. An estimated 25 per cent of cities globally already face water stress,[20] and the challenges of water management will only increase with rising temperatures.

Additionally, climate change worsens the urban heat island effect, which has resulted in cities being warmer on average than nearby rural areas attributed to transformations in the built environment (e.g. dense buildings with limited reflectivity or greenspaces that promote cooling) and greater heat from vehicular transport and buildings.[21] More frequent and intense heatwaves are resulting in major health burdens, especially amongst the elderly, children and other vulnerable groups in urban areas.[22] The 2020 Carbon Disclosure Project survey of 670 cities (mainly in the North America and Europe) indicated heat-related illness as the most commonly reported health concern.[23]Annually, an estimated 7 million people die prematurely due to air pollution (both indoor and outdoor) while also causing a substantial reduction in years of healthy life. [24]

Air pollution, which is inextricably linked to climate change, can penetrate the bloodstream and affect all organ systems. Impacts can be either transitory (e.g. coughing) or long-term and irreversible, ranging from cardiovascular and respiratory disease, lung and other cancers, asthma and other non-communicable diseases (NCDs), poor birth outcomes and developmental challenges.[25] Urban air pollution is often linked to motor vehicles and local fuel consumption (e.g. household heating), as well as to industrial activities, refuse burning and biomass consumption. In 2021, the WHO substantially tightened its air quality guidelines for the first time since 2005.[26] Efforts to uphold the new guidelines would sharply reduce premature mortality and morbidity. If the WHO's new stringent standards are met in 1,000 European cities with a total population of over 168 million people, an estimated 109,188 deaths could be prevented annually due to particulate matter ($PM_{2.5}$) and another 57,030 premature deaths due to nitrogen dioxide (Table 7.1).

Additional health burdens linked to motorized vehicles are road traffic injuries, which are the leading cause of mortality

Table 7.1: Potential reductions in premature mortality for European cities if air quality guidelines are met

	PM25(95%CI)	Nitrogen dioxide (95%CI)
2005 WHO Global Air Quality Guidelines	51213 (34036-68682)	900(0-2476)
2021 WHO Global Air Quality Guidelines	109188 (72846-145947)	57030(0-155257)
Lowest level in any city	124729 (83332-166535)	79435 (0-215165)

Table: Number of premature deaths that could be prevented in European cities if PM_{25} and nitrogen dioxide concentrations met guidelines or lowest levels

Source: Khomenko et al, 2021, p. 764.

in cities globally. Annually, an estimated 1.35 million people die from road traffic accidents, with accidents now the leading killer of people aged 5 to 29 years old.[27] In Thailand, an estimated 22,000 people die annually due to road traffic injuries, many of whom live in cities. Highlighting the multilayered nature of urban health risks, many highly polluted cities also have limited access to safe walkways, cycling lanes or parks. The provision of these can encourage active lifestyles, combat obesity, improve mental health and reduce air pollution and NCDs.[28]

Highlighting the multilayered nature of urban health risks, many highly polluted cities also have limited access to safe walkways, cycling lanes or parks

Rapid urbanization, food system transformations (especially the consumption of ultra-processed foods with high levels of fat and sugar) and changing activity patterns towards more sedentary lifestyles are leading to significant shifts in disease profiles towards diet-related health risks.[29] Recent findings indicate that "unhealthy diets pose a greater risk to morbidity and mortality than does unsafe sex, and alcohol, drug, and tobacco use combined," while food systems are already pushing beyond safe ecological boundaries.[30] Meanwhile, there is a negative environmental footprint from industrial agriculture (particularly

Air pollution from Cars © NadyGinzburg/Shutterstock

meat and dairy production), which has been associated with rising water scarcity, major reductions in biodiversity, and emissions of methane and other greenhouse gases.[31]

A growing urban health concern is the increase in mental related illnesses. Mental disorders are in the top 10 leading causes of disease burdens globally, and the number of disability-adjusted life years (DALYs) lost due to mental illness has increased sharply from 80.8 million in 1990 to 125.3 million in 2019.[32] Access to mental healthcare is especially rare in low- and middle-income countries, where there are few studies on past interventions.[33] Rising levels of depression, anxiety and other mental health impacts have been linked to COVID-19, particularly for essential workers, those with heightened caring duties (especially women), racial/ethnic minorities and other vulnerable groups.

7.1.2 The changing causes of mortality in cities

Longitudinal analysis has revealed the changing causes of mortality in cities, underscoring the rising toll of NCDs in both low-income and higher-income cities. In 2019, the three leading causes of death globally were cardiovascular diseases, including strokes and ischaemic heart disease (IHD), respiratory diseases such as lower respiratory infections and chronic obstructive pulmonary disease (COPD), and neonatal conditions, with 7 out of the 10 top causes due to NCDs (Figure 7.1). For the lowest-income nations, in 2019, the two leading causes of death were neonatal conditions and lower respiratory infections, followed by IHD and stroke; diarrhoeal diseases and malaria were ranked fifth and sixth. But across other regions, the leading cause of death is the same: ischaemic heart disease.

Higher consumption of fats and processed sugars alongside reduced activity profiles are linked to increasing prevalence of obesity, diabetes, hypertension, heart disease and diet-related cancers that lead to premature mortality in urban areas.[34] Urban diets and activity patterns are strongly shaped by the built environment and city planning decisions. For example, the pessimistic scenario for urban futures is already a reality for low-income urban residents who live in so-called "food swamps" or "food deserts." In food swamps, there is an abundance of unhealthy food for sale from fast food outlets and convenience stores. Food deserts have limited access to grocery stores that sell fresh produce or other sources of affordable, healthy foods.[35]

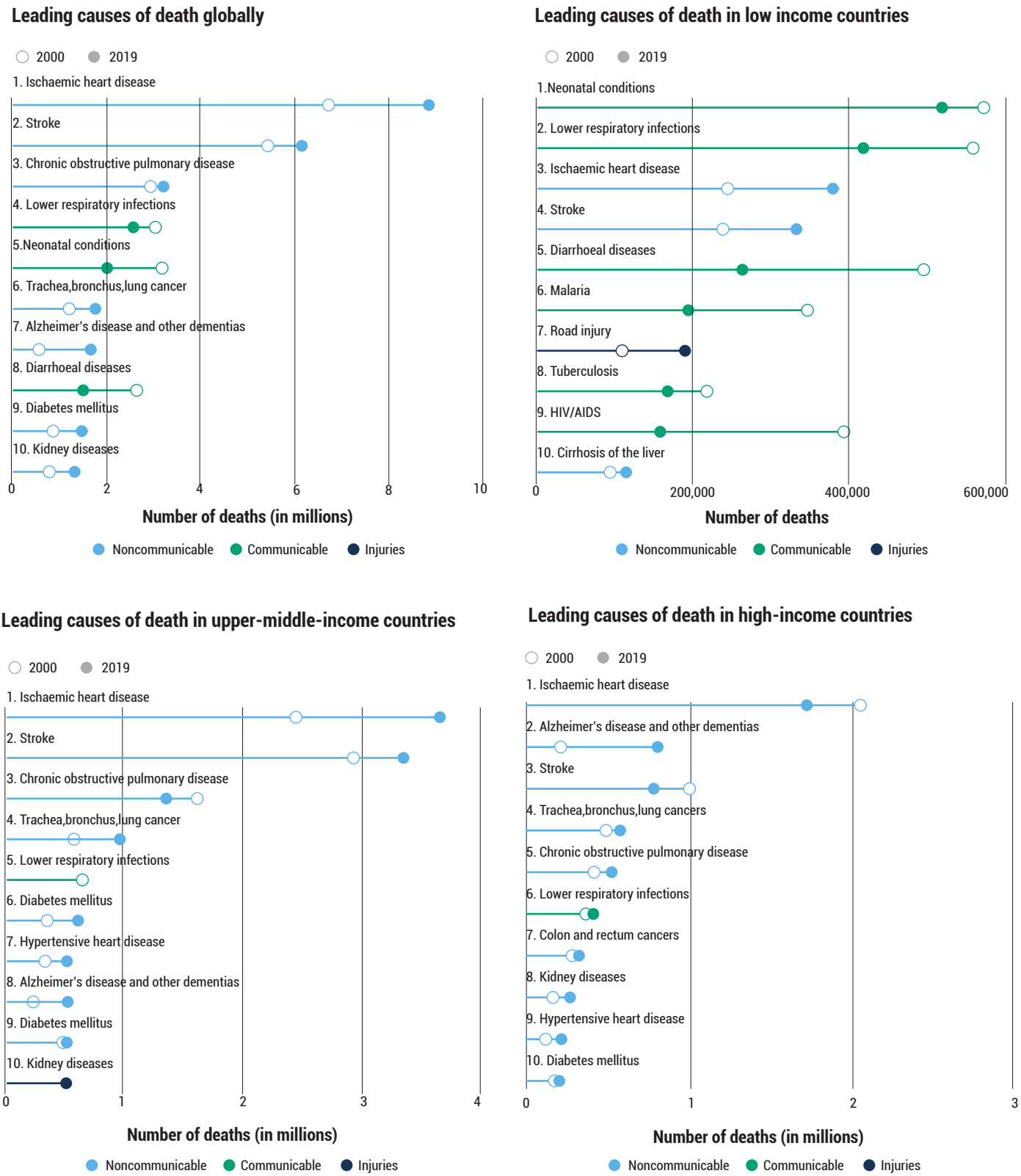
As a result of these socio-spatial patterns that inhibit healthy diets, some urban residents suffer from a complex challenge known as the double burden of malnutrition, defined as the "simultaneous manifestation of both undernutrition and overweight/obesity." Although patterns vary worldwide, residents in the lowest income quintiles are increasingly overweight and obese, including in Latin American and Asian cities.[36] An estimated one-third of stunted children globally live in urban areas.[37] Moreover, due to the prevailing gender-inequitable division of labour, women are usually tasked with providing and preparing food, which can impose major time and health burdens (especially in low-income areas without adequate WASH and refrigeration).[38] There is potentially a vicious circle, where gendered burdens as well as income poverty, unsanitary living conditions and malnutrition reinforce each other.

Kisumu, Kenya, offers a specific portrait of changing urban health threats in the developing world. Malnutrition was the leading behavioural cause of death in 1990, but malnutrition fell to the fourth leading behavioural cause by 2019 (Figure 7.2). Unsafe sex, high blood pressure, air pollution, high body mass and other dietary risks had grown increasingly important in Kisumu by 2019. These changes underscore the rising impacts of NCDs and air quality. There was also a heightened burden linked to HIV/AIDS, which rose starkly from 14 per cent of Kisumu's total deaths in 1990 to 26 per cent in 2019. Confirming the ongoing dietary changes, Kisumu's total deaths due to stroke and IHD increased from six per cent to eleven per cent from 1990–2019, while protein-energy malnutrition deaths fell from eleven per cent to less than four per cent of deaths.

Although Jakarta is a far larger and wealthier city than Kisumu, Jakarta's causes of mortality have also undergone a comparable change with the rise of NCDs and falling levels of malnutrition from 1990–2019. Malnutrition was Jakarta's leading behavioural cause of mortality in 1990, but by 2019 it had been replaced by high blood pressure, high body mass and high fasting plasma glucose, issues which are all linked to changing diets (Figure 7.3). In 2019, stroke and IHD each comprised up to 16 per cent of total deaths in Jakarta, with another 8 per cent due to diabetes.

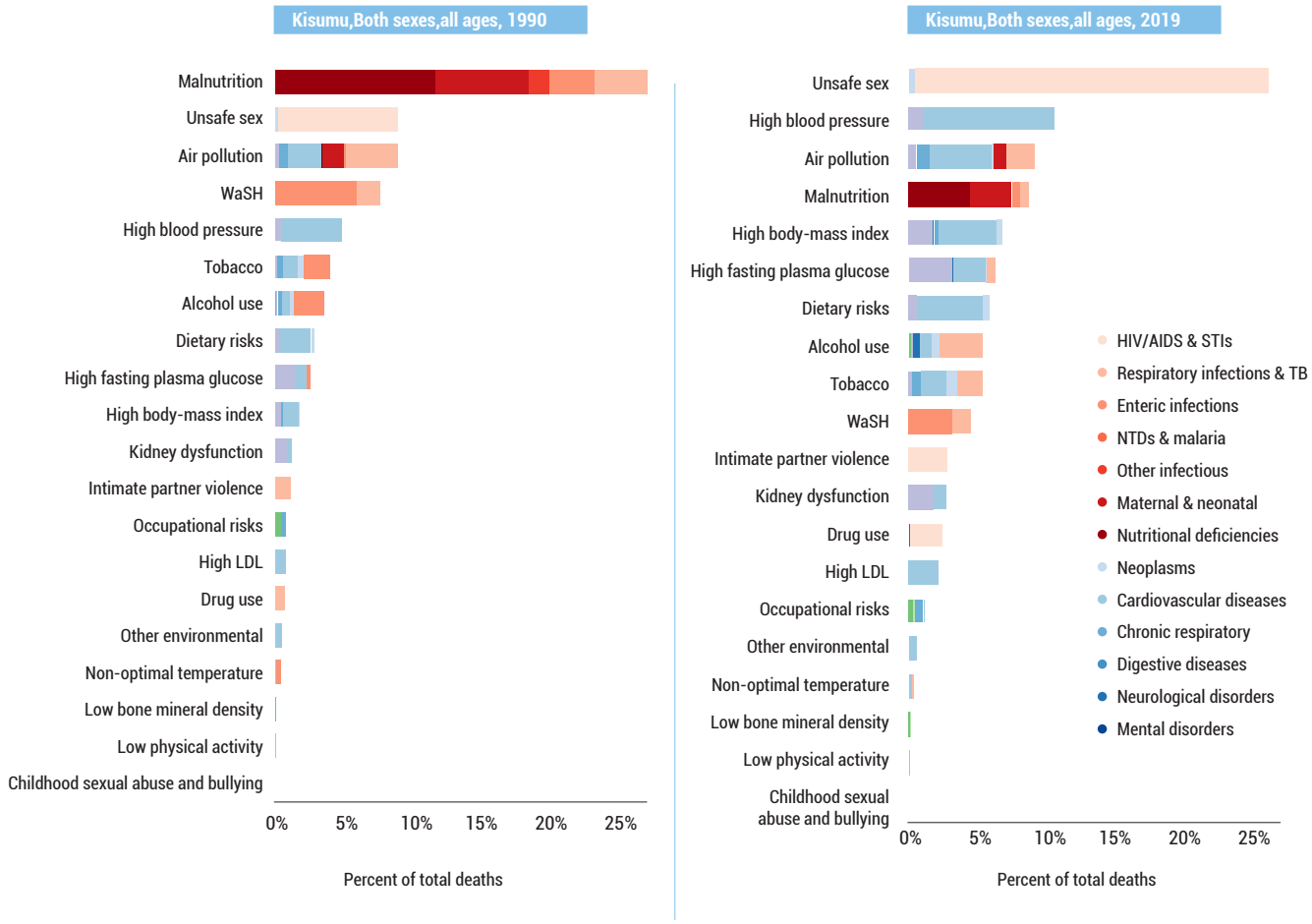
Meanwhile, detailed data from London reveals the shared challenge of NCDs across low- and high-income areas (Figure 7.4). In 2019, IHD, stroke and COPD were among the leading causes of death in both London's high-income boroughs of Kensington and Chelsea as well as the poorer Tower Hamlets. However, deaths linked to drugs, self-harm, Alzheimer's and other factors still differed between the two boroughs.

Figure 7.1: Leading global causes of death (2000 and 2019)



Source: WHO, 2020.

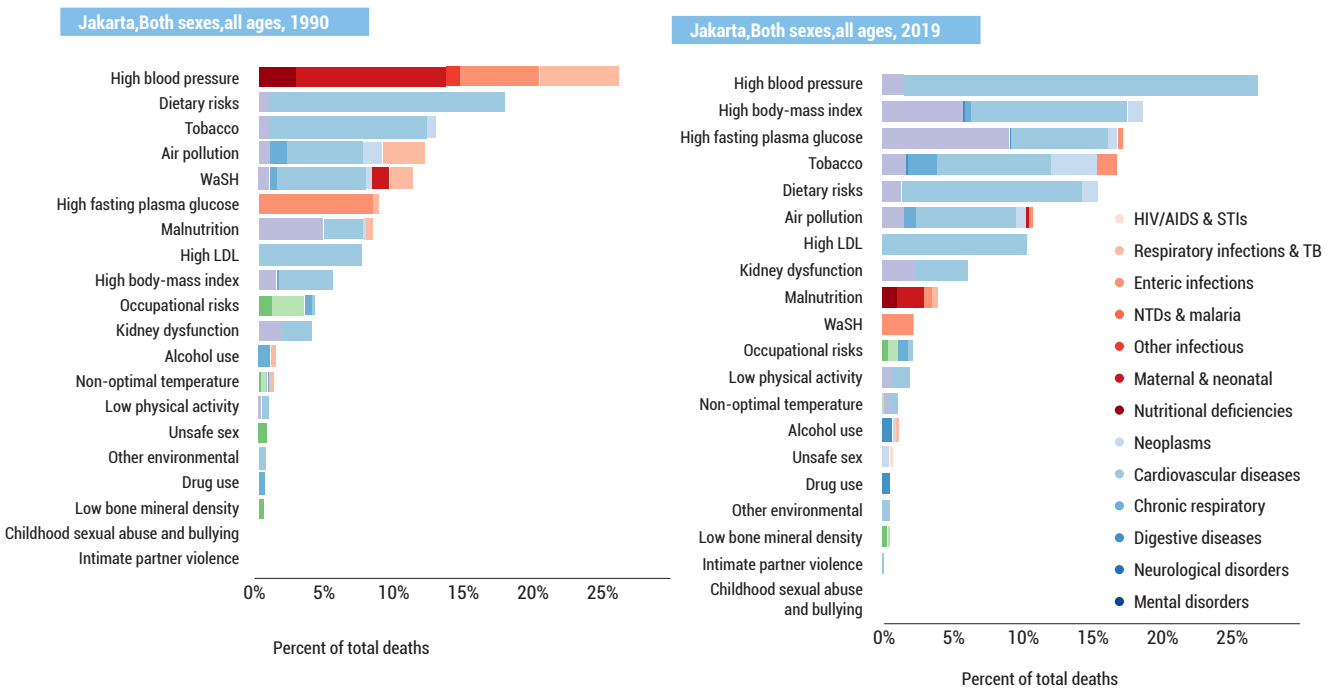
Figure 7.2: Leading behavioural causes of mortality in 1990 and 2019 in Kisumu, Kenya (percentage of total deaths by risk factor)



Source: Institute for Health Metrics and Evaluation, 2022

Street food vendors in Jakarta, Indonesia. © CatwalkPhotos/Shutterstock

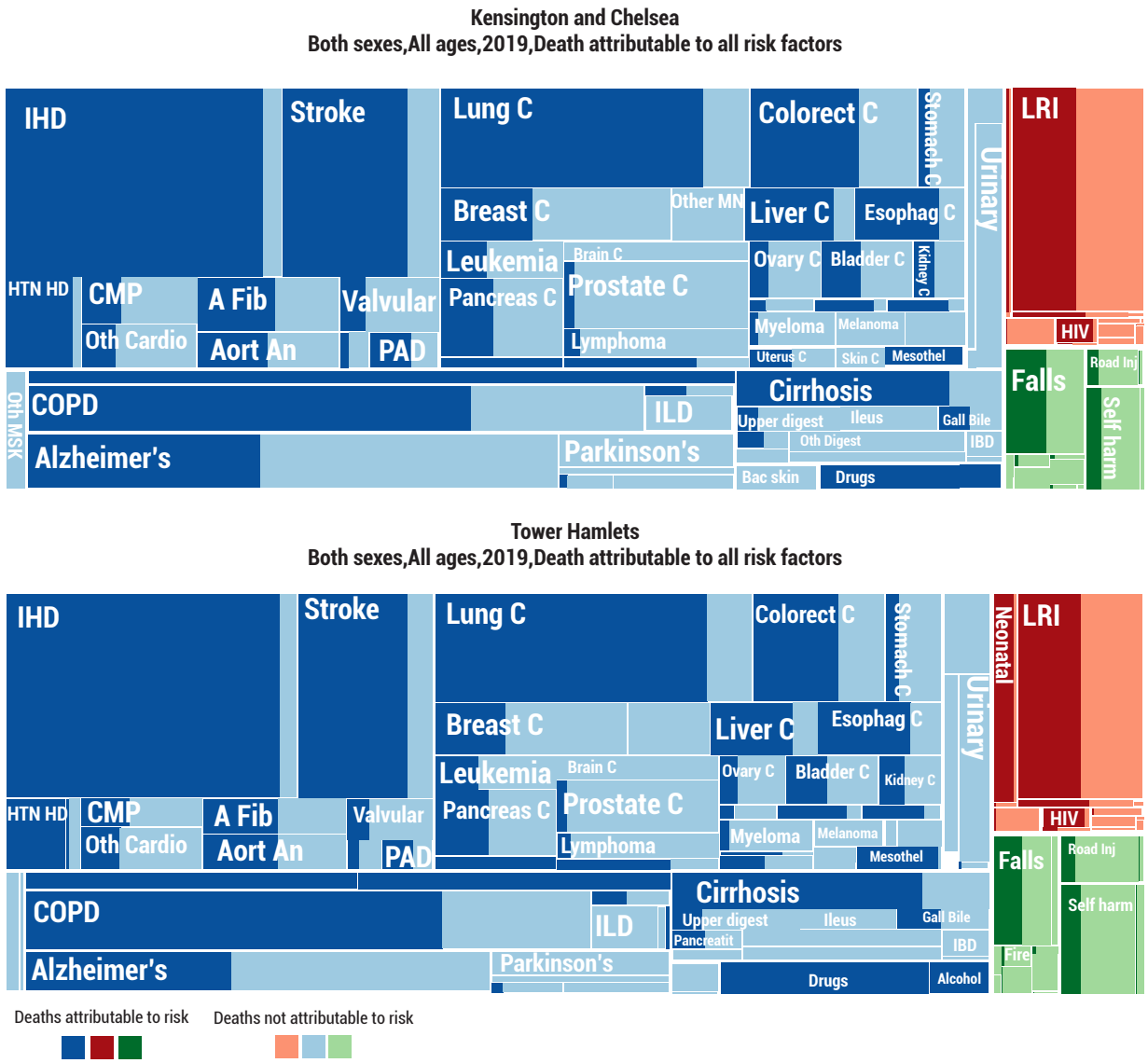
Figure 7.3: Leading behavioural causes of mortality in 1990 and 2019 in Jakarta, Indonesia (percentage of total deaths by risk factor)



Source: Institute for Health Metrics and Evaluation, 2022.

Slums of Patna, Bihar state, India. © Yury Birukov/Shutterstock

Figure 7.4: Causes of death in 2019 for London's Borough of Kensington and Chelsea (wealthy neighbourhood) and Borough of Tower Hamlets (poorer neighbourhood)



Source: Institute for Health Metrics and Evaluation, 2022.

7.1.3 An intersectional view of urban health inequities

In many urban centres, the same health risks are experienced and acted upon in starkly different ways. For instance, racial discrimination and segregation often negatively affect health by reducing minority groups' access to healthcare while heightening the concentration of poverty and exposure to environmental hazards.[39] Defined as "health inequities," such differences in health outcomes are "not only unnecessary and avoidable, but in addition, are considered unfair and unjust."[40] If left unchecked, these health inequities will lead us on a path to the pessimistic or even high damage urban future scenario.

An intersectional view can uncover how factors such as race, gender, disability, sexuality and socioeconomic status, among others, may interact to shape life experiences (e.g. access to healthcare, livelihoods, and housing) and to heighten health risks or deepen disadvantages in cities. Intersectional analyses can help to understand "diverse individuals and social groups, [who] experience the intersection of different structural drivers of exclusion in unique and situated ways."[41]

As intersectionality remains a nascent area of urban health research, this sub-section offers illustrative findings and seeks to motivate future health-promoting interventions that truly leave no one behind. A gender-sensitive intersectional approach may spark interventions with marginalized groups that better meet their healthcare needs. This approach can also help to amplify their voice in decision-making.

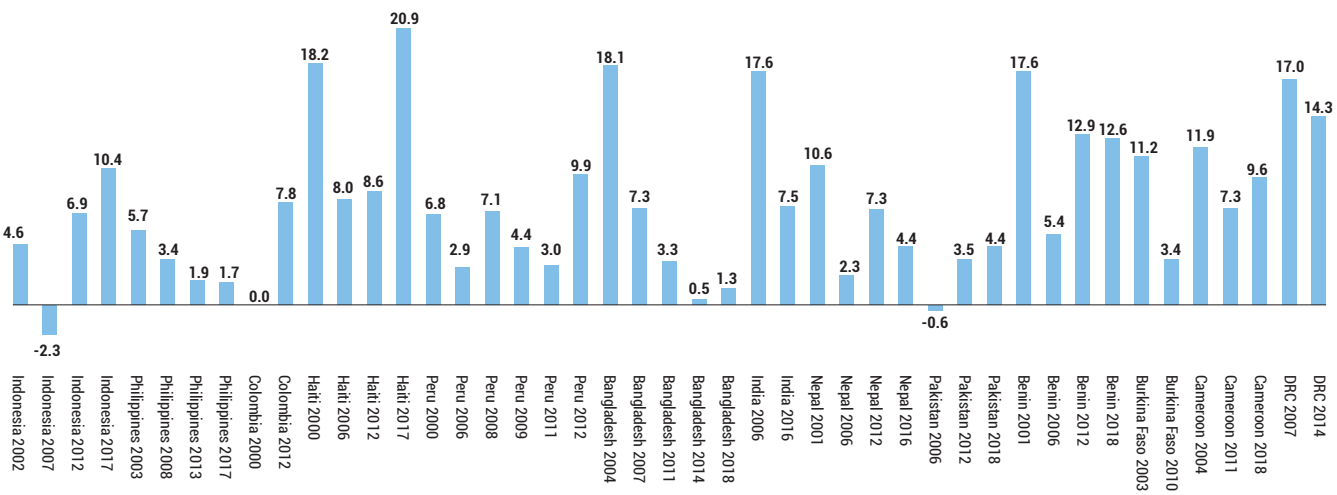
Individual city dwellers' health risks and outcomes are influenced by a complex array of factors. Many cities have entrenched differences in health outcome linked to socioeconomic, environmental and political factors that together contribute to complex urban disadvantages. For instance, studies suggest that black and other racial minorities experience poorer health outcomes throughout the course of their lives. Low-income black women in Brazilian cities may face especially acute challenges in accessing healthcare; struggle to combine caring duties with lengthy commute times and precarious, low-paid employment; and grapple with racial discrimination and intergenerational poverty.[42] Meanwhile, transgender people of colour in Chicago often struggle to find adequate healthcare, which is linked both to racism and transphobia. Although some respondents sought healthcare providers that cater for LGBTQI residents, they also were concerned by these providers' racism.[43]

Rich and poor city dwellers in many low- and middle-income countries may differ markedly in their levels of infectious diseases and in rates of maternal and child mortality.[44] The poor are typically compelled to live in the least developed areas of a city, often places that are poorly integrated to the urban fabric, where dilapidated environments contribute to worse health outcomes and greater risk of premature deaths. This phenomenon is known as the urban health divide. According to a review comparing tuberculosis rates in slums to national prevalence rates, slum dwellers may be five times more likely to have this disease,[45] which is often linked to overcrowded shelter alongside minimal access to affordable, high-quality healthcare.[46] Increasingly, there are also major disparities within cities in the incidence of non-communicable diseases.[47] Although patterns vary worldwide, residents in the lowest income quintiles in Latin America and Asian cities exhibit higher incidences of the double burden of malnutrition.

A gender-sensitive intersectional approach may spark interventions with marginalized groups that better meet their healthcare needs

Disparities in measles vaccination rates likewise illustrate the urban health divides (Figure 7.5). Inequitable access to vaccines was especially profound in Haiti, where in 2017,

Figure 7.5: Urban inequalities in measles vaccination rates as shown through differences between non-slum urban areas and slums (in absolute per cent) for children aged 12–23 months



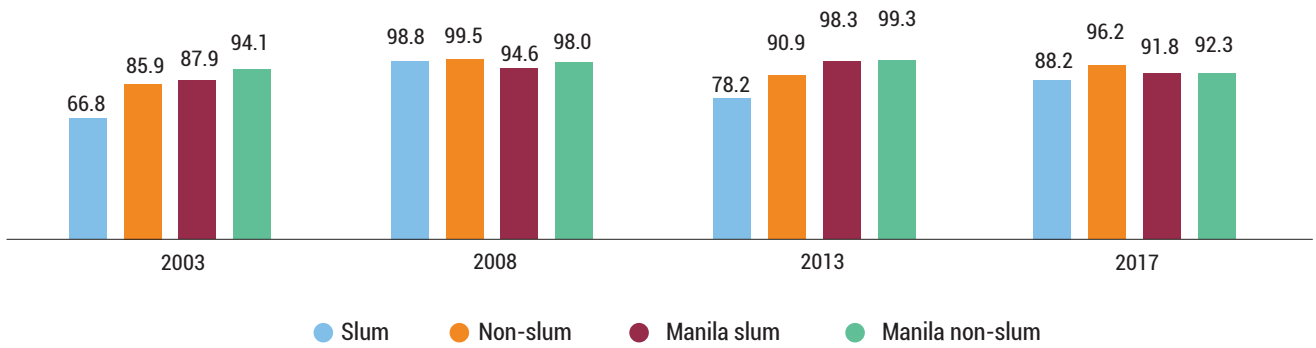
Source: UN-Habitat, 2021i.

48.2 per cent of slum dwellers were vaccinated compared to 79.1 per cent of non-slum urban residents (a difference of 20.9 per cent). Promisingly, the gap in measles vaccination rates for India fell from 2006 to 2016 (from 17.6 per cent to 7.5 per cent) as rates in India's slums rose from 67 per cent to 80.2 per cent and those in non-slum urban areas rose slightly from 84.6 per cent to 87.7 per cent.

Access to skilled birth attendance can again vary markedly between and within cities, as well as over time (Figure 7.6). From 2003 to 2017, Filipino women in slums increasingly gave birth in a health facility (rising from 40.3 per cent to 79.3 per cent), but this rate remained far below the levels of women in non-slum urban areas, whose access to health facilities rose from 74.8 per cent to 92.5 per cent over the same period. Notably, Filipino mothers' levels of access to health facilities in 2017 were far higher in Manila, where nearly 100 per cent of women gave birth in health facilities (across slum and non-slum areas).

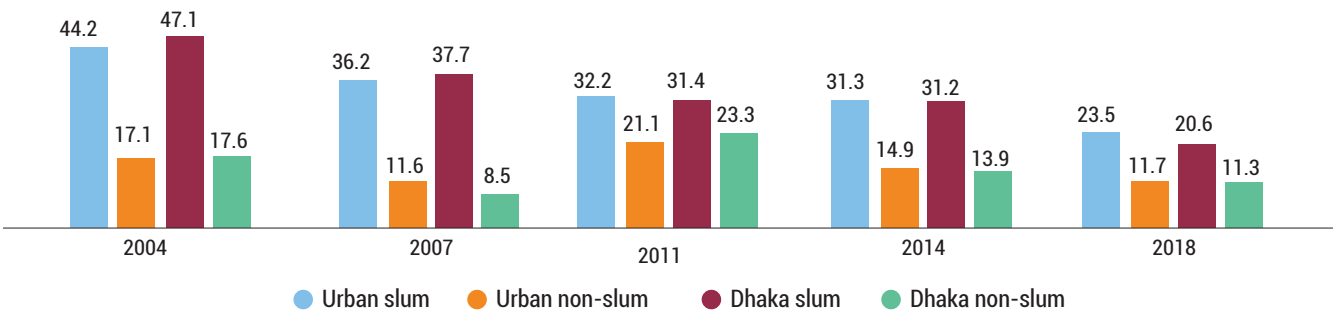
Other findings on urban child nutrition have uncovered enduring inequalities, even as there can be some progress over time. As seen in Figure 7.7, in Bangladesh from 2004 to 2018, levels of child stunting in slums fell almost by half from 44.2 per cent to 23.5 per cent, although this improvement was still double the levels of stunting in non-slum urban areas (where levels declined from 17.1 per cent to 11.7 per cent over the same period).

Figure 7.6: Skilled birth attendance in the Philippines: percentage of births with skilled health personnel in all urban slum areas, all non-slum urban areas, Manila slum areas and Manila non-slum areas (2003–2017)



Source: UN-Habitat, 2021i.

Figure 7.7: Child stunting in Bangladesh comparing all urban slum areas, all non-slum urban areas, Dhaka slum areas and Dhaka non-slum areas (2004–2018) based on percentage of children aged 0–59 months who are below minus two standard deviations from median height-for-age



Source: UN-Habitat, 2021i.

Cities are increasingly home to displaced populations including refugees, economic migrants and internally displaced people, whose health challenges remain poorly understood. The ongoing conflict in Ukraine triggered yet another global refugee crisis as millions of Ukrainians fled. Globally, an estimated 60 per cent of refugees reside in cities (rather than in refugee camps or rural areas), with many living in informal settlements or other urban areas with low-quality shelter.[48] Forcibly displaced residents in cities may face xenophobia or other discrimination; language barriers and employment restrictions (as if they live refugee camps, they are often expected to remain there); and limited access to healthcare, mental health services or other much-needed assistance to cope with trauma.[49]

Cities are increasingly home to displaced populations including refugees, economic migrants and internally displaced people, whose health challenges remain poorly understood

Another growing concern that could lead to the high damage scenario for urban futures is the shift of battlegrounds to urban environments (Box 7.2). While open field battle away from human settlements dominated warfare for centuries, World War II saw modern warfare fight over towns and cities. The use of heavy weaponry in towns and cities inevitably leads to heavier civilian casualties as well as the destruction of basic infrastructure that is vital for the functioning and basic health of communities such as water, sanitation, gas and electricity lines, leaving fragile communities vulnerable to infectious diseases.[50]

The resulting disruptions from armed conflicts weaken health systems in multiple ways including the physical destruction of hospitals, flight of healthcare workers as well as the interruption of child vaccination and communicable disease surveillance programmes. These damaged infrastructure and health systems require intense time and resource investments to rebuild, thus creating prolonged instabilities and intractable poverty as resources are diverted away from development.[51] The health impacts disproportionately affect women and children with over 60 per cent of preventable maternal deaths and 45 per cent of neonatal deaths estimated to occur in these fragile conflict burdened settings. [52]

The use of heavy weaponry in towns and cities inevitably leads to heavier civilian casualties

Damaged residential building, Kyiv, Ukraine © Drop of Light/Shutterstock

Box 7.2: Armed conflicts worsen health in cities

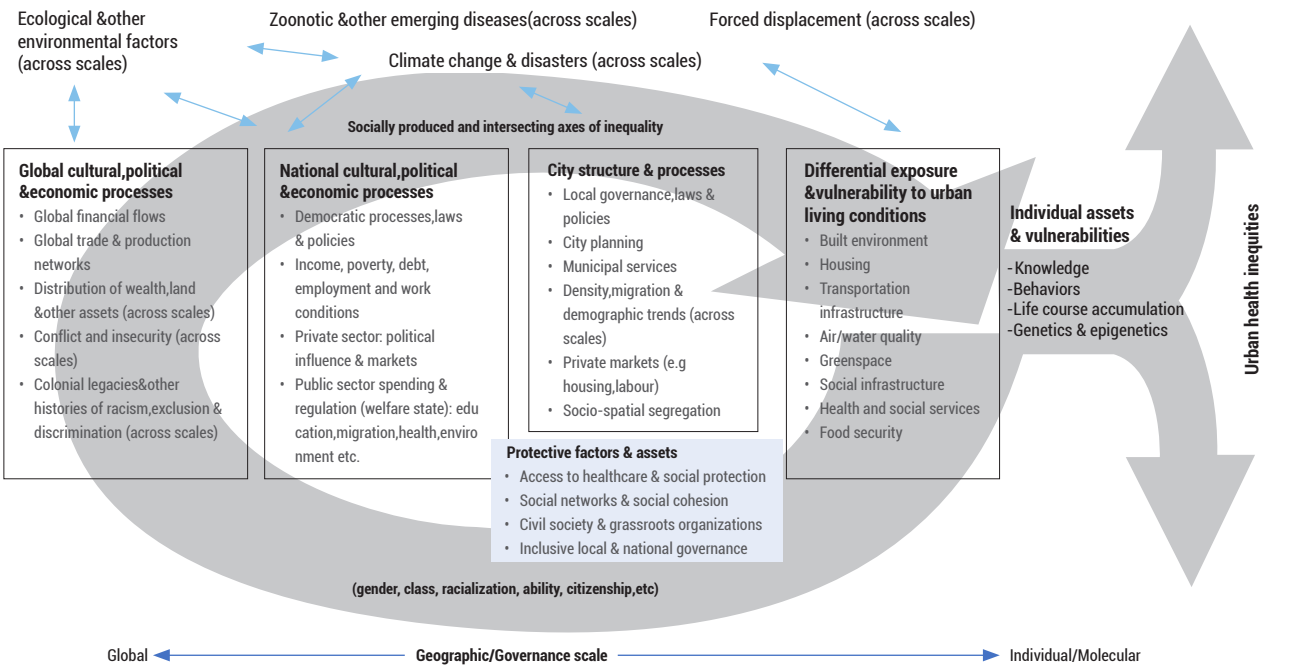
In six of the most disruptive conflicts currently waging in the world today, major cities have been active battlegrounds: Kabul in Afghanistan; Adwa, Bora, Dessie and Kombolcha in Ethiopia; Aleppo, Dier, Ezzour and Damascus in Syria; Mariupol and Kharkiv in Ukraine; and Sanaa and Aden in Yemen. There is evidence of subsequent devastating effects on health. For instance, Yemen recorded the world's worst cholera outbreak of the twenty-first century between 2015 and 2017 with over 2 million identified cases. There have also been spikes of diarrhoea in Syrian cities during periods of intense violence. In the Ethiopian region of Tigray, it is estimated that healthcare workers did not provide any child vaccinations nor deliver any antenatal or postnatal care in the first 90 days of conflict. With nearly two decades at war, Afghanistan experiences cyclical outbreaks of measles, with regular spikes reported in Kabul.

Source: IRRC, 2022; Gesesew et al, 2022; WHO, 2022e.

Maternity hospital in Kolonyi, Uganda. © Dennis Wegewijs/shutterstock

Finally, broader socioeconomic trends contributing to urban health inequalities may include globalization, market-led policy reforms and distribution of assets that in turn influence urban service provision and economic development trajectories (Figure 7.8). At the urban level, access to infrastructure, service provision, and city planning decisions (linked to inclusive or exclusionary forms of governance) can significantly shape health outcomes. Meanwhile, at the individual level, a gender-sensitive, intersectional approach can help develop tailored strategies to tackle these complex sources of disadvantage. Urban decisionmakers can draw on community assets and develop inclusive, context-specific strategies to address the drivers of urban health divides across several scales.

Figure 7.8: Framework on intersecting, multi-level urban health inequities: key factors from global to city and individual scales



Source: Adapted from Brisbois et al, 2019.

7.1.4 Slum health

The importance of addressing intersectional disadvantages is especially clear in informal settlements, where residents often face hazardous shelter, heightened vulnerabilities to disasters and multiple social, economic and political exclusions. Residents of informal settlements typically encounter environmental health risks linked to inadequate living conditions (e.g. low-quality housing, unclean energy and unsafe WASH) that contribute to elevated risks of communicable diseases including tuberculosis, dengue, cholera and other waterborne illnesses.[53] For slum dwellers, the high damage and even pessimistic scenarios for urban futures could lead to catastrophic health outcomes.

Furthermore, informal settlements are often highly vulnerable to climate change and consequent extreme weather events as a result of low-quality shelter and infrastructure, risky locations (e.g. floodplains, steep slopes), and meagre access to emergency services.[54] These vulnerabilities can result in heightened "everyday" risks as well as small-scale and large-scale disasters that often contribute to communicable disease outbreaks and to deepening poverty.[55] With limited incomes, low-quality housing and few physical assets, residents of informal settlements often struggle to recover from disasters or everyday risks.[56] Ongoing floods, fires or other disasters may lead to a vicious circle of poverty and ill-health. According to research in Niamey, Niger, repeated small disasters can have a so-called "erosive effect" on household assets in informal settlements.[57] Underscoring the need for climate justice, low-income urban residents cumulatively contribute the least to greenhouse gas emissions but often lack the capacities to adapt effectively and require additional support[58] (see Chapter 5).

Tenure insecurity in slums contributes to poor health outcomes and exclusions via various pathways, including burdens linked to evictions and highly inadequate infrastructure provision. Evictions may result in disrupted livelihoods and social networks, escalating stress and mental illness, and lost physical assets (all linked to rising poverty and exclusion), as well as injuries or even deaths.[59] Many official agencies will not invest in areas with unclear land ownership, and in turn, tenure insecurity may lead to poorer health outcomes because of limited access to WASH, electricity or other services and infrastructure. Moreover, electricity access in informal settlements is often influenced by tenure security: although many cities have higher overall levels of power access than rural areas, slum dwellers may be unable to access legal electricity (due to tenure insecurity, onerous registration processes and/or cost barriers) and instead may rely on polluting solid fuels or hazardous illegal electricity connections.[60] Tenure insecurity in Mumbai is associated with worse health outcomes: residents of non-notified slums (with greater tenure insecurity than Mumbai's notified slums) had poorer child health and adult nutrition outcomes, likely due to curtailed access to services and infrastructure with deeper roots in slum dwellers' political marginalization.[61] Residents of informal settlements may also face heightened levels of HIV/AIDS, as well as injuries due to road traffic and interpersonal violence, although such risks vary widely between and within these neighbourhoods.[62]

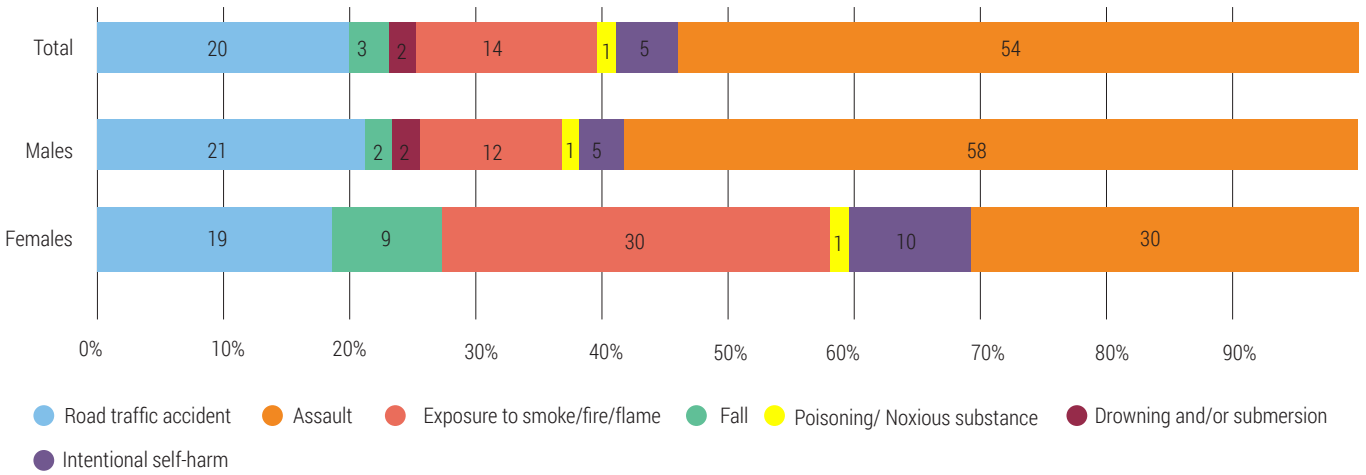
Attention to gender, age, disability and other differences is crucial to understand health vulnerabilities in informal settlements. Inadequate infrastructure and services provision often has gender-inequitable impacts. Due to gendered division of labour, women in informal settlements, who are often tasked with utilizing fuels to cook, are at an elevated risk of respiratory and cardiovascular disease due to lack of access to clean energy.[63] Inadequate sanitation has often disproportionately affected women and girls. Women and girls in African and Asian informal settlements often walk to public toilets at night-time in poorly lit, insecure settlements (thereby risking rape or assault), or else they must resort to degrading, improvised solutions such as plastic bags at home.[64]

Children are especially susceptible to communicable diseases including pneumonia and diarrhoea; the ensuing care burdens typically fall disproportionately on their mothers, who in the absence of adequate WASH often struggle with rising stress, mental health impacts and lost earnings.[65] Along with missed schooling, repeated outbreaks of childhood diarrhoea can contribute to malnutrition, long-term cognitive impairments and reduced productivity in adulthood.[66] Holistic WASH solutions are essential to support women and other vulnerable groups including the elderly and people with disabilities (PWDs), especially in areas where the environment and its attendant risk and harms leads to worse health outcomes and greater risk of premature deaths.

Underscoring the need for climate justice, low-income urban residents cumulatively contribute the least to greenhouse gas emissions but often lack the capacities to adapt effectively

Disaggregated data even within a small urban locale can offer insights into the gendered experience of urban health threats in slums. According to surveys in two Nairobi informal settlements, Korogocho and Viwandani, with about 2,500 adults (aged 15 and older), HIV/AIDS was the cause of 24.5 per cent of women's deaths but just 12.3 per cent of men's deaths from 2002–2012 (Figure 7.9).[67] Meanwhile, over 30 per cent of men's deaths were due to injuries as compared to just 7.2 per cent of women's deaths. Injury patterns were again highly gendered: assault was the leading cause of men's injury mortality (58 per cent), as compared to 30 per cent amongst women's injury deaths. Another 30 per cent of women's deaths were caused by fire, as compared to 12 per cent of men (likely due to gendered differences in cooking), and women were twice as likely to die from intentional self-harm as men (10 per cent vs. 5 per cent).

Figure 7.9: Causes of injury deaths among adults by sex (aged 15 and older) in two of Nairobi's informal settlements (January 2003–December 2012, N=2,464)



Source: Mberu et al, 2015.

Street in Kibera slum, Nairobi, Kenya. © Renatas Repcinskas/Shutterstock

7.2 Advancing Urban Health Equity

This section considers recent promising strategies for addressing urban health inequities considering the multiple pathways of deprivations and exclusions that contribute to differential health outcomes. The fundamental causes of health inequities are found in social, political and economic conditions. Action to address these underlying causes and tackling the pathways through which they influence health outcomes can substantially help to promote equitable well-being in cities and arrive at the optimistic scenario for urban futures.

Health inequities eliminate the so-called "urban advantage" as a health crisis cuts through economic, social and geographical barriers

The COVID-19 pandemic brought to the fore the urgency of addressing urban health inequities. Health crises have historically been pivotal moments of transformation for urban areas. Health inequities eliminate the so-called "urban advantage" as a health crisis cuts through economic, social and geographical barriers. It therefore follows that enhancing equitable access to healthcare, as well as the social, spatial and physical factors that promote equitable urban health outcomes, should be a priority of urban planning for sustainable urban futures.

7.2.1 Leveraging technology for inclusive healthcare

Novel strategies are needed to promote accessible, high-quality healthcare, and cities are increasingly adopting ICT-enabled strategies to support accessibility and inclusivity. Research on telemedicine (the provision of medical care via telecommunication technology) has found several benefits, including for patients with NCDs. According to evidence from the United States, telemedicine has improved health outcomes for patients with stroke and heart failure, as well as helping to manage diabetes and other chronic conditions.

Recently, COVID-19 has accelerated the uptake of digital technologies, and there are encouraging examples of how technology was leveraged to ensure that no one was left behind. Rising levels of depression, anxiety and other mental health impacts have been linked to COVID-19, including for key workers, those with heightened caring duties (especially women), racial/ethnic minorities and other vulnerable groups. Many countries have enhanced helplines during COVID-19 to provide mental health services (e.g. in Nigeria, Indonesia) including call-in lines tailored to healthcare workers in the Maldives and South Africa, or for South Asian migrants in Gulf countries.[68] In Karachi (Pakistan), the Aga Khan University initiated free, online training sessions in parent-mediated therapy to support children with disabilities that was available nationwide.[69]

Telemedicine was also used to support older persons and people with dementia during the pandemic and bridge the unequal access to healthcare in Gangdong-gu, South Korea (Box 7.3).

Drawing upon the 2014 Ebola response, Liberia's mHero communication system that is operated on a basic talk-and-text pattern (no smartphone needed) was used to update healthcare workers about COVID-19 outbreaks. Likewise, within one month after its first reported COVID-19 case on 14 March 2020, Rwanda was able to deploy the use of drones in the city of Kigali and the secondary cities of Rubavu and Rusizi targeting densely populated, hard-to-reach areas that presented high-risk nodes in the management of the pandemic. The country coordinated a multi-sectoral response that leveraged technology alongside healthcare worker deployment in targeted hotspots.[70] The ability of Rwanda to leverage technology for effective interventions

Box 7.3: Using technology to bridge access to dementia care in Gangdong-du City, Republic of Korea

Gangdong-gu, a municipality on the outskirts of Seoul, has a longstanding commitment to serving people with dementia, including a safe village and public guardianship for people with dementia. During COVID-19, the Centre for Dementia initiated remote clinical assessments by staff who offered technical support and expanded access to web- and phone-based consultations (both for families and dementia patients). Gangdong-gu also offered dementia classes online, cognitive stimulation kits and tailored case management for addressing needs such as nutrition, housing, and emotional support throughout the pandemic. Using disaggregated data, the municipality was able to identify 261 people living alone and/or on basic incomes, which enabled tailored case management that considered emotional and daily living support.

Source: WHO, 2021d.

during the pandemic enabled the capital to remain on course in implementing its Kigali Master Plan 2050 that aspires for a green, efficient, inclusive, vibrant and productive city.[71]

There is urgent need, however, to overcome the digital divide facing disadvantaged populations, and few studies have considered how telemedicine can reach persons with disabilities or other excluded urban groups (Chapter 9).[72] Sometimes the anonymity of mobile consultin can be beneficial in discussing sensitive topics, but there are nevertheless concerns around lack of regulation, affordability, appropriateness and privacy.[73] There are again concerns about inclusion in "smart cities" strategies, which may overlook health equity concerns.[74] While digital solutions are a key element of healthy urban futures, these will need to be combined with other innovative strategies to reach vulnerable groups.

7.2.2 Strengthening collaboration with community organizations

There is an essential need for ongoing, disaggregated data collection with attention to multiple disadvantages to ensure that no one is left behind.[75] However, there may be limited data available for marginalized residents including the homeless, refugees and residents of informal settlements who may be excluded in census taking or other official data.[76] Findings on health risks by residents themselves, including those in informal settlements, can help to fill data gaps while also informing effective place-based interventions. This "citizen science" is an essential complement to official data sources.

There is an essential need for ongoing, disaggregated data collection with attention to multiple disadvantages to ensure that no one is left behind

Members of the global network Shack/Slum Dwellers International (SDI) have gathered in-depth findings on shelter provision, access to services and other determinants of health in their own neighbourhoods.[77] SDI's informal settlement profiles and mapping exercises have explored residents' access to housing, WASH, electricity, solid waste management, health clinics and fire stations (if available), alongside local demographics, eviction threats and locational hazards (e.g. recent experiences of natural disasters). These surveys have provided much-needed disaggregated findings and fostered effective health promotion strategies when acted upon.

7.2.3 Strengthening community health workers

In many cities, community health workers (CHWs) are essential service providers of inclusive health systems, but in urban settings policymakers do not recognize their contributions as much as those in rural areas. Where adequately supported in skills and resources, CHWs play a central role in urban health equity, including promotion of maternal and child health, enhancing health literacy and addressing both NCDs and communicable diseases.[78] In cities in low- and middle-income countries, CHWs typically provide health education, outreach, and direct service

Community-led data collection in Mombasa's informal settlements. © SDI Kenya

provision such as home visits. During COVID-19, CHWs were essential in promoting community sensitization and contact tracing, providing referrals and assisting patients in self-isolation.[79] In Ethiopia, CHWs conducted outreach via digital megaphones and audio messages in local languages; Viet Nam created a telemedicine platform to reduce CHWs' exposure to patients while still raising public awareness about COVID-19.[80] To build CHWs' capacities and strengthen their future contributions, policymakers will need to enhance their training in digital and other skills, offer significantly improved compensation and benefits (e.g. support with housing, transport, and PPE), and provide prizes or other recognition.[81] With women comprising the majority of CHWs, it will be fundamental to support the empowerment of these women and enhance the profile of these crucial but unsung agents of inclusion and change.

7.2.4 Addressing social and environmental determinants of health

Promising initiatives that blend strategies for enhancing urban built environments and upgrading informal settlements with other social goals have improved several health outcomes among vulnerable groups while also promoting climate resilience, poverty reduction, and youth livelihoods. Improving access to affordable adequate housing, WASH, roads and drainages and other vital infrastructure can significantly reduce the risks of disasters and communicable disease transmission, while also enhancing access to healthcare and emergency services. Furthermore, equitable upgrading partnerships with strong grassroots participation can improve the social determinants of health such as safety, social cohesion, and empowerment.

Adequate housing is considered key in promoting health and building resilience to systemic shocks.[82] People experiencing homelessness often face barriers to accessing healthcare and several interrelated disadvantages, such as racial or gender-based discrimination, behavioural health issues and substance abuse. Additionally, homeless populations are especially exposed to extreme weather events, and their physical and mental health is likely to be affected by climate change.[83] The policy approach known as "housing first" recognizes the importance of providing a safe, secure dwelling before tackling health and other challenges of homeless people. Several European and North American cities have adopted this policy with initiatives to provide rapid housing but, importantly, not requiring abstinence from substance use. Findings suggest that this approach may improve health in the short term.[84] Compared to the control group, participants in housing first programmes had fewer emergency department visits and were more likely to be housed at 18–24 months; it remains unclear whether the improved health outcomes will be sustained over the longer term. It is also vital to develop integrated initiatives that extend beyond improving housing and healthcare access to support mental health, access to social services and combat the stigma surrounding homelessness.

"Housing first" recognizes the importance of providing a safe, secure dwelling before tackling health and other challenges of homeless people

Urban safety is another social determinant of health. In Cape Town, South Africa, the Violence Prevention through Urban Upgrading (VPUU) initiative has helped de-escalate violence in the township of Khayelitsha. VPUU has prioritized youth employment, vigorous community participation and social inclusion; it also utilized urban design strategies to promote passive surveillance and create integrated community centres.[85] By combining improvements in infrastructure with social programmes and strong local participation, this holistic initiative led to a 34 per cent reduction in exposure to interpersonal violence from 2013–2015.[86]

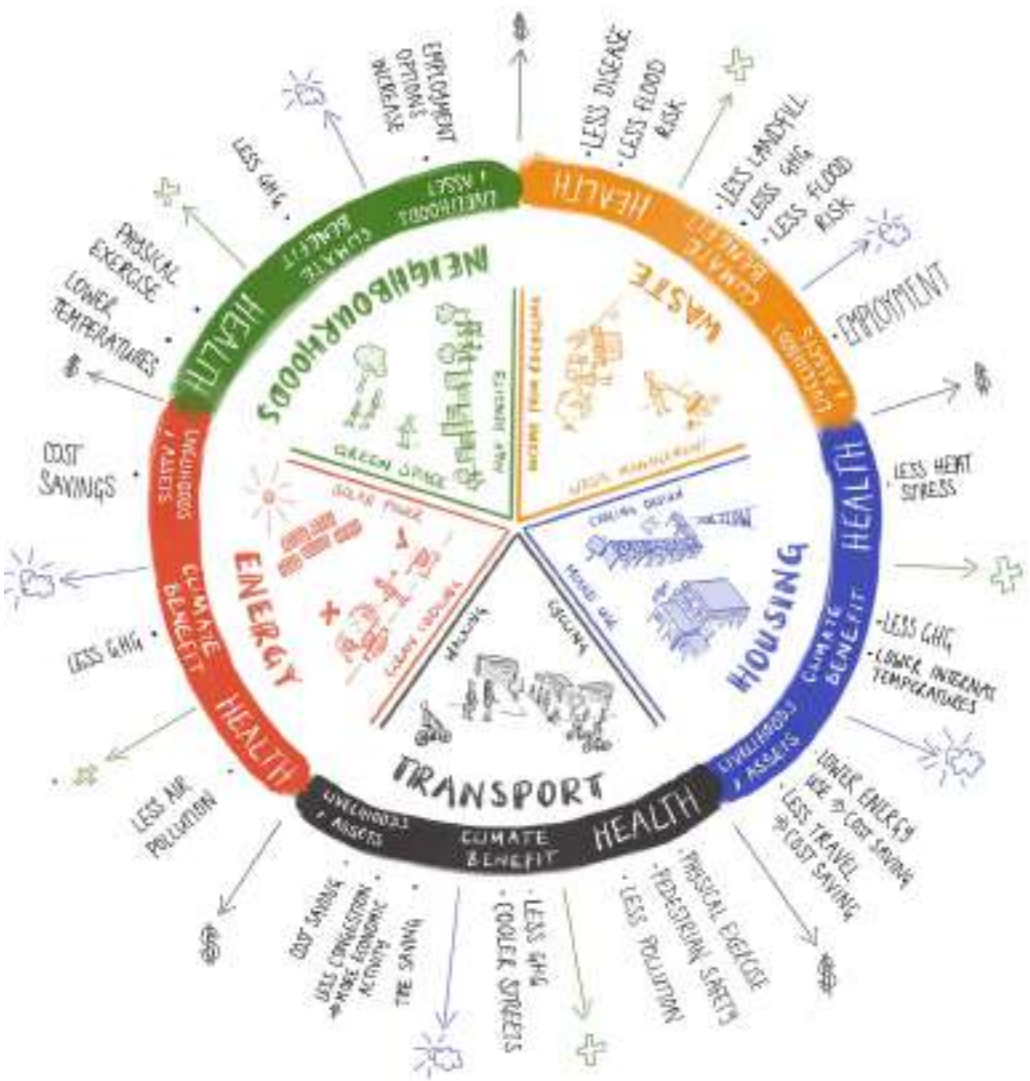
Reliable street lighting can generate several gains in health, safety and livelihoods by extending the amount of time that local businesses can operate in the evening, with particular benefits for women working from home and others working within informal settlements.[87] In over 40 cities in Brazil, the Efficient Community Programme has enhanced access to fluorescent lamps and energy-efficient refrigerators, as well as supporting behavioural change using local youth as agents to enhance outreach and uptake in low-income areas.[88] Chilean cities and Santo Domingo, Dominican Republic, have supported climate resilience through low-carbon building designs (including incremental construction that supports affordability), and selective relocation away from flood-prone areas.[89]

Climate change mitigation schemes can improve the social determinants of health. Cape Town retrofitted 2,300 houses with solar water heating and roof insulation as part of a low-income housing project funded by the Clean Development Mechanism, a United Nations carbon offset scheme.[90] In addition to lowering emissions, this project has reduced poverty by lowering heating expenditures, improved respiratory health outcomes by adding home insulation and provided on-the-job

training to local residents who implemented the retrofits.[91] In Richmond, US, the city's climate action plan provided free or subsidized solar power and home energy efficiency programmes; the related programme RichmondBUILD trained young people (often ex-offenders) in building trade skills to install the new solar and home energy equipment.[92] More generally, cooler housing designs can reduce heat stress and lower energy consumption, with particular benefits for older persons, children, people with pre-existing health conditions and other vulnerable groups.[93]

Meanwhile, efforts to promote cycling and pedestrianization can support access to work or education, improve local economies due to enhanced footfall, and may enhance disaster resilience by providing all-weather paths in informal settlements (Figure 7.10). For instance, Nairobi's large-scale upgrading programme in Mukuru known as a Special Planning Area (SPA) has created inclusive transport solutions thanks to strong collaborations between local officials, academics, civil society and community residents.[94] For the upgraded transport network, the widest road will be 12 meters rather than 48 meters (as per Kenyan planning standards for roads), thus displacing far fewer residents than would have occurred if using conventional roads. At the same time, the SPA has prioritized improving non-motorized transport (an appropriate choice as most Mukuru residents are pedestrians), which also fosters healthy and low-carbon mobility patterns.

Figure 7.10: Health, climate and livelihood/asset benefits of upgrading informal settlements



Source: Diagram by S. Ray in Sverdlik et al, 2019, C40/Cities Alliance.

7.2.5 Holistic age-friendly strategies

Age-friendly strategies are increasingly important in cities with sizable populations of older persons, and integrated approaches can offer meaningful improvements in health, mental wellness and inclusion. WHO's Age-Friendly Cities programme has highlighted the importance of changing perceptions of older persons, involving a wide range of stakeholders (e.g. community organizations, universities and businesses) and developing multisectoral approaches.[95]

For instance, the Age-Friendly Manchester Culture Programme brought together 19 cultural organizations (including museums, orchestras and theatres) to ensure these activities are more accessible to older persons. The UK city sought to address social isolation and racial exclusion by partnering with organizations representing older people from black, Asian, and minority ethnic groups. Manchester also established an Age-Friendly Assembly and Older People's Board that promotes participation and inclusive decision-making.[96]

In the Turkish municipality of Besiktas (population of 181,000, with 20 per cent age 60 and above), integrated social centres have helped enhance older persons' cognitive skills and social integration, as well as offering group therapy and counselling services.[97] The centres provided several opportunities to join cultural activities such as concerts and seminars, as well as gardening, games and various crafts. Individuals participating in Besiktas' centres had lower levels of depression and higher social support levels than those receiving home-based assistance.

Finally, in Valencia, Spain, the city council worked with the Older People's Association to create eight "bio-healthy parks" that simultaneously promote healthy exercise, access to green spaces and enhanced socialization.[98] Each Park has several types of exercise equipment tailored to older people's needs (e.g. to maintain agility and balance), and the initiative also benefited from cross-sectoral collaboration within the city council.

7.2.6 Health as a catalyst for social and environmental justice

Health can catalyse interventions that generate far-reaching gains in social and environmental justice. Air quality is strongly linked to climate change, environmental injustices and multiple shortfalls in urban planning. The health burden disproportionately falls upon low-income residents and neighbourhoods who have typically contributed the least to greenhouse gas emissions but often lack the capacities to adapt effectively and require additional support (Box 7.4).[99] As discussed in Chapters 5 and 6, building infrastructure to support non-motorized transport and planning for 15-, 20- and 30-minute cities are among the ways that cities can achieve

Health can catalyse interventions that generate far-reaching gains in social and environmental justice

Box 7.4: Inequitable impact of air pollution in Greater Accra, Ghana

In Greater Accra recent findings highlighted the inequitable, far-reaching impacts of air pollution. Amongst patients hospitalized due to air pollution or road traffic injuries, the poorest two quintiles were over-represented, accounting for 45 per cent of admissions. The majority were informal workers and the associated medical costs, most of which they bore out of pocket, represented up to double their annual earnings. Furthermore, indirect costs of air pollution were often extremely high for lung cancer, ischemic heart disease and road traffic (due to lost incomes), making the impacts of air pollution even more unmanageable for the poorest residents.

Source: Lampert et al, 2021.

simultaneous co-benefits, such as reducing greenhouse gas emissions, creating healthier neighbourhoods and reducing per capita expenditures on public infrastructure maintenance.

How cities respond to endemics like HIV/AIDS are also health catalysts for social justice. In 2014, UNAIDS launched the 90-90-90 Initiative with the following targets: 1) 90 per cent of people living with HIV know their HIV status, 2) 90 per cent of people who know their HIV-positive status are accessing treatment, and 3) 90 per cent of people on treatment have suppressed viral loads. In making strides to achieve these goals, cities and municipalities are increasingly adopting a social justice approach to design initiatives tackling exclusions and intersectional inequalities.[100]

Over 300 cities and municipalities have joined UNAIDS in this effort. Collectively they are known as Fast-Track Cities and have achieved impressive results. Kigali, nearly reaching the global treatment targets (currently 91-94-89),[101] has prioritized reducing HIV infections among adolescents, supports female sex workers (e.g. with condoms and access to information), and is developing coordination mechanisms with stakeholders such as faith-based organizations, the judiciary, and civil society groups focused on gender-based violence and human rights. In Amsterdam, a broad consortium of stakeholders involved in HIV prevention and care developed an integrated strategy that successfully helped to reduce transmission. Amsterdam's highest-risk groups are migrants and men who have sex with men (MSM); the HIV Transmission Elimination Amsterdam initiative targeted these groups to help reduce new diagnoses, while also including affected communities and interdisciplinary specialists on the project's team.[102] Key interventions in Amsterdam include same-day testing and treatment, focused awareness-raising campaigns and enhanced access to preexposure prophylaxis (PrEP). New York City's "status neutral" approach has sought to tackle HIV-related stigma and offers social marketing for PrEP, anti-stigma programmes targeting LGBTQI youth and enhanced HIV surveillance.[103]

7.3 Envisaging Health for Sustainable Urban Futures

This forward-looking section will highlight initiatives that can foster several gains in health, reduce intersectional inequalities, promote climate resilience and advance other SDGs in urban areas, thus avoiding the high damage or pessimistic scenarios for urban futures and instead, chart a course toward the optimistic scenario. While health-promoting initiatives are necessarily place-specific, this section will identify an overarching vision for action towards healthy urban futures focusing on nine interrelated priorities: 1) the "health in all policies" (HiAP) approach; 2) ongoing, disaggregated data collection 3) developing holistic, place-based strategies; 4) pursuing climate and health co-benefits; 5) enhancing universal health coverage and complementary social programmes; 6) strengthening health system preparedness 7) supporting healthy diets and active lifestyles; 8) enhancing health at the workplace; and 9) promoting mental health.

7.3.1 The "health in all policies" (HiAP) approach

Recognizing the need to promote health across all urban interventions, cities are increasingly adopting a "health in all policies" (HiAP) approach to mainstream health in decision-making across all sectors and levels.[104]

Cities are increasingly adopting a "health in all policies" (HiAP) approach to mainstream health in decision-making across all sectors and levels

HiAP is the governance mechanism seeking to add a health perspective across all policies and embed health literacy into the city planning system, land-use decisions and other relevant sectoral interventions.[105] Past examples of HiAP-informed interventions include the provision of urban greenspaces in Barcelona and open street initiatives in several Latin American cities to provide low-carbon and active transport alongside health-promoting behaviour changes.[106] Factors that can support HiAP uptake are stable funding, long-term political support, open communication, clear mechanisms for public engagement, established taskforces and legal obligations that compel policymakers to apply the HiAP approach.[107]

One way of implementing the HiAP approach is through the preparation of a health impact assessment (HIA), a tool that can facilitate intersectoral action and analyse a proposed intervention's impacts on population health and the distribution of such effects. HIAs have been used in a range of regions including Canada, New Zealand, Thailand and across the WHO's European Healthy Cities Network.[108] HIAs are useful mechanisms to support decision-making and can be used collaboratively across stakeholders, with successful examples benefiting from local political support, HIA trainings and collaborations with academic or public health institutions. However, some HIAs may be too narrowly defined, and it may be useful to develop other strategies that can mainstream

Box 7.5: Lessons from the health in all policies approach in Richmond, US to foster health equity and climate resilience, reduce violence and discrimination, and promote social justice

The local government in Richmond adopted a comprehensive HiAP approach to reduce violence and health inequalities while supporting inclusive economic development and climate resilience. In this working-class community of 115,000 in the San Francisco Bay Area of California, many residents faced elevated levels of morbidity and mortality due to hazardous exposures from a nearby oil refinery, rampant gun violence and systemic racism.

Following mobilizations by local environmental justice advocates, officials in Richmond approved the United States' first HiAP ordinance in 2014 focused on addressing toxic stresses and building upon three years of collaborative discussions amongst community organizations, academics, health officers and other local officials.

Subsequently, health indicators in Richmond markedly improved and an array of initiatives helped promote multiple benefits for health and social inclusion. For instance, three neighbourhood-specific action plans were developed with low-cost but health-promoting actions such as urban gardens, mobile clinics, slowing traffic and creating sports courts. Underscoring the multi-sectoral strategies needed to support well-being, the city adopted a living wage ordinance of US$15 per hour, prepared a climate action plan and pursued activities to reduce violence via mentorship with ex-offenders and employment promotion. Key lessons include 1) the importance of institutionalizing health equity goals, 2) focusing on underlying causes of poor health, 3) working collaboratively with racial/ethnic minorities, ex-offenders, and other marginalized groups, 4) supporting inclusive economic development, and 5) flexible, learning-by-doing strategies.

Source: Corburn, J., 2020; City of Richmond, 2022.

health into decision-making across all sectors.[109] Richmond illustrates how an ambitious, multisectoral HiAP approach can meaningfully address multiple inequalities while promoting health and social justice (Box 7.5).

7.3.2 Ongoing, disaggregated data collection

Since urban health risks are multilayered and change rapidly, policymakers require ongoing data collection with attention to emerging inequalities and the diversity of health challenges in urban areas. Using disaggregated data to inform inclusive interventions, policymakers can develop holistic initiatives that address complex urban health inequalities and support locally rooted solutions. Disaggregated data is needed to uncover health disadvantages in cities, which may be based on factors such as age, disability, gender, occupation, race/ethnicity, migration status and/or sexuality as well as residence in marginalized neighbourhoods.

City authorities can leverage digital technology such as telemedicine platforms and drones to generate data in locations that are inaccessible using other data collection methods. Citizen science, through which communities lead in data collection, offers a useful tool for producing localized data and fostering participation among marginalized and hard-to-reach groups thus enhancing effectiveness of place-based health interventions. A complementary mechanism that is expanding across world regions is the urban health observatory model that collates disaggregated data to reveal and analyse health inequalities and support effective place-based interventions as well as build capacity with interdisciplinary researchers.

7.3.3 Developing holistic, place-based strategies

Rather than merely prioritizing a single disease or vulnerable group of city dwellers, policymakers will need to recognize that health outcomes are deeply rooted in social, economic, environmental and political factors across several scales.

Urban health inequities are often stubborn and pervasive, yet such concerns are not immune to change. Challenges linked to the built environment—themselves often tied to political and socioeconomic exclusion—can be tackled via place-based initiatives and complementary strategies produced in alignment with marginalized residents and local organizations.

Action on the underlying causes of differential health outcomes and tackling the pathways through which they influence urban health can substantially help to promote well-being in cities.[110] Some of the very same sources of urban

risk can be transformed into opportunities for well-being. To take one example, urban form itself can "either promote or hinder healthy behaviours" via the provision (or absence) of infrastructure, healthy food options and neighbourhood connectivity amongst other factors.[111]

Holistic, participatory upgrading interventions can offer a potent mechanism and an inclusive process for enhancing residents' well-being, with extensive possibilities to support healthy, equitable, and sustainable transformations.[112] By improving WASH, durable housing, all-weather roads and other vital infrastructure, upgrading can significantly help to reduce the risks of disasters and communicable disease transmission, while also enhancing access to healthcare and emergency services. Furthermore, equitable upgrading partnerships with strong grassroots participation can promote the social determinants of health such as safety, social inclusion and empowerment. Prior upgrading partnerships in cities including Medellín, Ahmedabad and Nairobi indicate that upgrading can also enhance equitable governance and accountability between

Health outcomes are deeply rooted in social, economic, environmental and political factors across several scales

formerly marginalized residents, local governments and service providers.[113] Achieving such gains will require multisectoral action and the development o inclusive, contextually rooted strategies that can address cities' complex health inequalities. Holistic approaches are inevitably complex, and efforts to support the underlying determinants of health will not be rapid or easy to achieve. But placing health equity at the core of urban policy (as in HiAP and related approaches) can create unparalleled opportunities for urban transformations and unify multiple progressive agendas, thus generating far-reaching gains in social and environmental justice.

7.3.4 Pursuing climate and health co-benefits

Leading researchers argue that the climate and ecological emergencies present the most urgent contemporary health challenges. As an Aga Khan University expert argues: "The greatest threat to global public health is the continued failure [to] keep the global temperature rise below 1.5°C and to restore nature."[114] In turn, there is a pressing need for sizeable investments in climate-resilient infrastructure and related health-promoting interventions, whose benefits would far exceed their costs. As the expert notes: "Better

Holistic approaches are inevitably complex, and efforts to support the underlying determinants of health will not be rapid or easy to achieve

air quality alone would realize health benefits that easily offset the global costs of emissions reductions."[115] Alongside massive gains in air quality, there are important opportunities to promote physical activity, improve the built environment and foster dietary changes that can simultaneously support urban health and climate resilience.[116]

There is a wide array of climate-related interventions with strong potential to improve health including via shelter initiatives, compact city planning and nature-based solutions (Chapters 5 and 6). Improving access to low-carbon, resilient infrastructure and other climate-friendly strategies can help to advance several SDGs in addition to creating major health benefits. Enhanced access to clean energy and climate-resilient infrastructure (SDGs 7 and 9) can simultaneously improve health, (SDG 3), tackle poverty (SDG 1) and foster gender equality (SDG 5) by overturning the gender-inequitable impacts of inadequate infrastructure.

There are also multiple health benefits from pursuing holistic strategies such as access to green spaces and active transport (i.e., improving cycling lanes, supporting pedestrianization) because such initiatives can enhance air quality, lower risks of obesity and NCDs, and improve mental health thanks to improved environmental quality and activity levels.[117] Parks and other green spaces can reduce urban temperatures and flood risks (by slowing runoff and retaining excess water), while also enhancing air quality and encouraging greater physical activity.[118] Entry points for interventions can range from the building and neighbourhood levels up to the district, city and regional scales. Figure 7.11 illustrates how supporting health at several interventions goes hand-in-hand with inclusive, equitable and sustainable urban development. Another model can be found in a framework called Towards Health uRbanism: InclusiVe Equitable Sustainable (THRIVES), which advances health beyond the individual to the community, ecosystem and planetary levels (Figure 7.12). It highlights the layers of interconnected benefits when health is placed at the centre of

Enhanced access to clean energy and climate-resilient infrastructure (SDGs 7 and 9) can simultaneously improve health, (SDG 3), tackle poverty (SDG 1) and foster gender equality (SDG 5) by overturning the gender-inequitable impacts of inadequate infrastructure

Figure 7.11: Potential benefits of urban climate actions for health, adaptation and mitigation

Category	Adaptation action	Mitigation		Health co-benefit
Nature based solutions	Urban greening			
	Other nature based solutions			
Infrastructure	Maintain and upgrade water treatment, sewage and sanitation facilities			
	Transport infrastructure			
	Increasing bike/walk lanes			
	Upgrading health infrastructure	N/A		
Urban planning design	Compact cities			
	Passive urban design			
Housing and Building design	Passive building design			
	Air conditioning			
Policy and Government	Integrated approach across			
	Mainstreaming adaptation and mitigation into local development			
	Improve partnerships			
	Prioritizing equity in adaptation planning	N/A		
Knowledge perception & behavior	Communication of co-benefits and actions to protect health	N/A		
	Support social networks			
Monitoring, Evaluation &warning system	Early waring systems	N/A		
	Response plans to protect vulnerable groups	N/A		
	Improved local monitoring of climate parameters	N/A		N/A

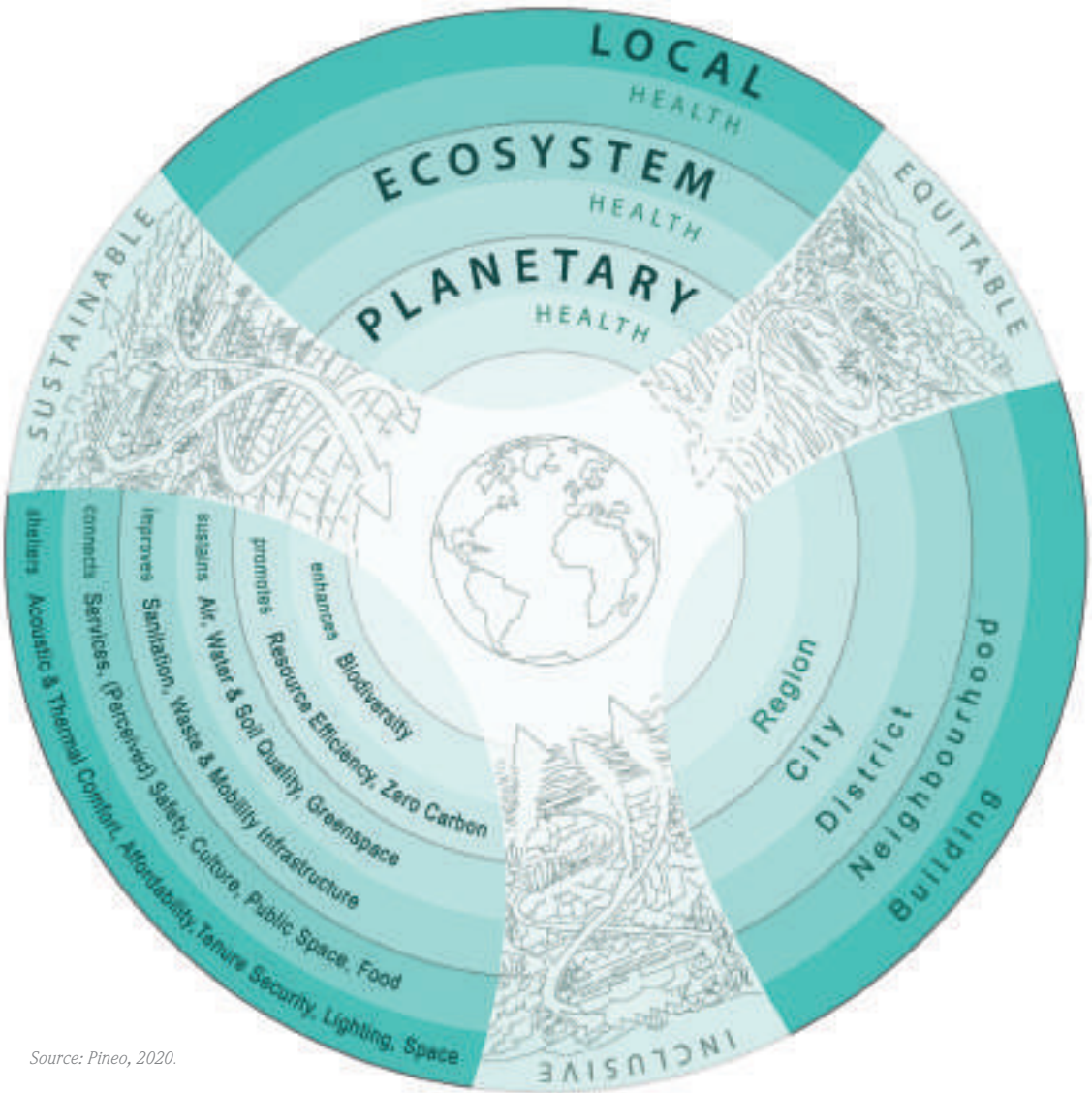
Source: Sharifi et al, 2021.
Note: Shades of green represent co-benefits, while those in orange represent trade-offs; darker colours represent the greater confidence attached to the association. Blank boxes currently have insufficient evidence.

urban planning and design to secure inclusive, equitable and sustainable urban futures.

7.3.5 Enhancing universal health coverage

"Leave no one behind" is the central transformative principle underpinning the SDGs and the New Urban Agenda. It represents the unequivocal global commitment by leaders to ensure that sustainable development is experienced by all. In the urban health context, consequently, there is growing consensus of the urgency to provide universal health coverage (UHC) for the 4 billion people who currently lack such guaranteed care.[119,120] Universal health coverage means that "everyone receives quality health services, when and where they need them, without incurring financial hardship." This social policy represents a key element of resilient, inclusive societies, as it can simultaneously support social justice, equitable economic development and the realization of human rights (Box 7.6).[121] Although important advances toward universal health coverage have been achieved since 2000, stubborn challenges remain in many settings.[122]

Figure 7.12 Towards Health Urbanism: Inclusive Equitable Sustainable (THRIVES) framework



Source: Pineo, 2020.

In the wake of COVID-19 pandemic, the value of social protection systems was demonstrated in not only supporting the most vulnerable but also reinforcing the collective health and well-being for all.

Even before COVID-19, countries struggled in expanding access to universal health coverage; there were already rising levels of catastrophic health expenditure (i.e., when households spend over 10 per cent of their budgets on health).[123] From 2015–2017, households with catastrophic health expenditures rose from 940 million to 996 million. The elderly and people with intergenerational households typically have the highest incidence of catastrophic health spending; medicines are usually a key driver of out-of-pocket spending and financial hardship.

Although strategies to expand universal health coverage will depend on local contexts, politics and financial considerations, a range of promising approaches have demonstrated how to leave no one behind including strong political commitment and the use of general tax revenue in Thailand and Mexico; making pregnant women universally eligible in Ghana; leveraging co-operative societies as intermediaries for informal workers in India; and providing subsidies to informal workers, schoolchildren, ethnic minorities and other vulnerable groups in Viet Nam.[124]

Box 7.6: Pro-poor strategies to expand universal health coverage

While universal health coverage is a key policy concern and may be achieved via several mechanisms, local initiatives and policy incentives to reach marginalized city dwellers will also be necessary. Pro-poor strategies to expand universal health coverage include:

- Reducing administrative obstacles by eliminating documentation requirements and/or enrolment fees and establishing automatic enrolment in universal health coverage as is the case in the Vajpayee Arogyashree scheme of Karnataka state (India).[125]
- Reducing or eliminating co-payments, such as in Thailand's UHC schemes.
- Addressing other barriers facing marginalized groups such as migrants/refugees (Chile and Thailand), informal workers (Viet Nam) and those with less education[126]

To support equitable improvements in provision, it is also crucial to offer comprehensive benefit packages for both inpatient and outpatient services and to fund universal health coverage with public sources. If universal access is not financially viable at first, policymakers can pursue "progressive universalism" such as prioritizing vulnerable groups and expanding coverage of high-priority health services to all.

7.3.6 Strengthening health system preparedness

COVID-19 is not the first nor will it be the last pandemic that cities will face; new outbreaks of other pandemics and major health emergencies are likely to occur.[127] In this reality, policymakers must reinvigorate health systems to address future shocks via an equitable, coordinated approach from the local to global levels.

The Independent Panel for Pandemic Preparedness and Response has identified several interrelated priorities such as investing in preparedness; enhancing surveillance and alert systems; and strengthening leadership and collaboration across the health sector and all levels of government, including at the highest levels. Expanding access to long-term funding streams will be essential both for preparedness and early response capacity.[128]

The WHO has found that preparedness is affordable,[129] which can help to spark cost-effective interventions to avoid future pandemics. To address emerging zoonotic diseases, there is a need for jointly tackling animal and environmental health surveillance, as proposed by the One Health Commission, with further collaborations across several sectors including transport, migration and WASH.

While global monitoring is generally the purview of national and international health agencies, adequate funding, human resources and trainings for local governments and municipal health providers in emergency response and preparedness will be crucial to support effective urban preparedness and response. Strong collaboration with community organizations and community health workers can play a key role in reaching residents, engendering trust in health systems during health emergencies and disseminating communication clearly, regularly, and transparently including in local languages and tailored to grassroots needs to help tackle misinformation and support health literacy.[130]

Local and national governments will need to continue expanding universal health care, which must be recognized as a crucial aspect of health systems preparedness. As underscored by COVID-19, barriers to healthcare provision may have catastrophic, persisting knock-on effects during emergencies.

7.3.7 Supporting healthy diets and active lifestyles

Alongside health-promoting policy interventions, policymakers will need to promote behaviour change and technological transformations to foster healthy, sustainable urbanization.[131] Such behaviour change interventions also

Local and national governments will need to continue expanding universal health care, which must be recognized as a crucial aspect of health systems preparedness

need to recognize social, cultural and other factors that may strongly shape behaviours such as consumer preferences.

Urban diets and food systems represent critical priorities for intervention, as efforts to support healthy diets may generate a wealth of benefits for urban health, climate resilience and environmental sustainability more generally. Recent findings indicate that "unhealthy diets pose a greater risk to morbidity and mortality than does unsafe sex, and alcohol, drug, and tobacco use combined," while food systems are already pushing beyond safe ecological boundaries.[132]

Based on findings from cities in the United States, expanding access to grocery stores or limiting the growth of fast-food outlets may be necessary but insufficient; there is also a need to promote demand for healthy foods. South Los Angeles instituted a yearlong ban on new fast-food restaurants, but no changes in consumption were found over five years, likely due to longstanding norms and preferences. Complementary outreach strategies are therefore needed to support the desirability and affordability of healthy foods.[133]

Further health benefits may be achieved by combining dietary initiatives with holistic strategies like to access to green spaces as well as promotion of active lifestyles and active transport (i.e., improving cycling lanes, supporting pedestrianization). Such initiatives portend co-benefits that enhance air quality, lower risks of obesity and NCDs, and improve mental health thanks to better environmental quality and activity levels.[134]

7.3.8 Promoting occupational health in the "future of work"

There is vigorous discussion of the "future of work" following COVID-19 but further consideration is needed of health, climate resilience, and co-benefit interventions

Bikers in Placetas, Cuba © UN-Habitat/Hector Bayona

with greater attention to multiple exclusions and the need to develop inclusive strategies. The pandemic's health and economic outcomes have markedly differed amongst wealthier urban knowledge workers (who can work from home with access to food and services) and those with heightened exposures like frontline health workers, factory workers and essential service providers.[135] Workers' access to insurance, healthcare and other benefits have also proved decisive in the pandemic's outcomes, with many precarious workers lacking social protections beyond (at best) short-term emergency relief measures.[136]

COVID-19 has demonstrated that occupational health risks are often gendered and racialized, with many of these disadvantages overlapping to heighten risks and entrenching ill health amongst racial/ethnic minorities, migrant workers or along other intersectional axes of difference.[137] Additionally, low-income women have overwhelmingly shouldered caring burdens while facing rising risks of gender-based violence and heightened job losses, as they were overrepresented in hospitality and other hard-hit sectors during COVID-19.[138] Many occupational health risks predate the pandemic and are especially acute amongst informal workers in cities in lower- and middle-income countries. Globally, an estimated 2 billion people work in the informal economy,[139] which is defined as all livelihoods lacking legal recognition or social protections.[140] As a result of their unregistered and unrecognized status, informal workers often remain invisible in official data and are neglected by health-promoting interventions.[141]

Future interventions are needed to develop holistic strategies to foster health and livelihoods of precarious workers, including migrants and youth. This could also explore how recent forms of equitable engagements can be built upon to enhance health and well-being at the workplace. For instance, during the initial phases of COVID-19, some cities created inclusive partnerships and enhanced recognition for informal workers. Food vendors in Kenya, Zimbabwe and other African nations were declared "essential" service providers during the health crisis, which sometimes stemmed from mobilizations by informal trader organizations.[142]

7.3.9 Promoting mental health

Improving access to mental health programmes and developing holistic strategies to address mental illness remain a key concern globally, especially in the wake of COVID-19. Without robust action, mental health problems will "contribute to human suffering, premature mortality, and social breakdown, and will slow down economic recovery,"[143] making this field an urgent priority not only for supporting health and dignity but also for continued economic and social development.

Key priorities for equitable, inclusive mental health initiatives are additional investments in mental healthcare providers, ensuring that mental health is covered under universal health coverage and primary healthcare interventions, offering additional capacity-building to health providers, and providing tailored, inclusive support to help meet service users' needs.[144]

There are often contextual specificities requiring locally rooted strategies to support mental health in urban areas. For instance, low-income migrants in cities may face heightened challenges in accessing mental health services. A review of Chinese rural-urban migrants' mental health indicated that migrant children averaged poorer mental health scores than urban children, which may reflect migrants' lower incomes, limited social networks and reduced access to services as compared to urban residents.[145] A focus on children and young people, as well as creating broader coalitions and countering stigma facing those with mental illness will again be vital to ensure healthier urban futures.

More broadly, it will be essential to move beyond biomedical approaches to mental healthcare and instead seek to address the social determinants of health; interventions also need to actively engage people with mental illnesses, including to provide peer support, foster empowerment and inform future strategies.[146]

7.4 Concluding Remarks and Lessons for Policy

The optimistic scenario for urban futures envisions brave commitments to make transformative progress for achieving the SDGs in the decade of action by tackling structural inequalities and creating conditions that foster social, economic and spatial inclusion to ensure that no one is left behind. Chapter 7 proposes that health can serve as a catalyst that unifies several SDGs and generates multiple far-reaching benefits beyond the absence of disease.

The multilayered, rapidly changing nature of urban health risks necessitates holistic multisectoral strategies that are complementary and additive. To be effective these strategies need to be informed and progressively refined by ongoing,

disaggregated data collection to reveal gendered as well as intersectional disparities for timely place-based interventions that will ensure no one is left behind. By mainstreaming the health in all policies approach with a focus on health equity throughout urban interventions, policymakers can help to address the underlying sources of health disadvantages and create unparalleled opportunities for inclusive, equitable and sustainable urban futures.

The facts and arguments presented in this chapter generate five key lessons for securing healthy urban futures:

- Urban policymakers should undertake multi-sectoral approaches (extending far beyond the health sector) to effectively address the social, economic political and environmental factors influencing health in cities. By mainstreaming health across all urban interventions (a HiAP approach), cities can realize multiple benefits and unlock synergies between health and sustainable development pathways.

- Ongoing, disaggregated data collection with attention to intersectional disparities and emerging health challenges in urban areas is essential for timely and effective interventions to address the multilayered, rapidly changing nature of urban health risks. City governments can leverage on technology and partnership with grassroot organizations to help fill data gaps while also amplifying the voice of marginalized groups in decision making.

- To effectively promote and secure health for inclusive, resilient, and sustainable urban futures, policymakers urgently need to address the root of urban health inequities entrenched in racial divides, gendered discrimination, xenophobia and other sources of disadvantage. Action to address these underlying causes and tackle the pathways through which they influence health outcomes can substantially help to promote equitable well-being in cities and arrive at the optimistic scenario for urban futures.

- Local and national governments need to prioritize achieving universal health coverage as a pathway of strengthening health systems preparedness. Additionally, policymakers need to work with and strengthen a diverse array of urban health providers—including community health workers—to enhance healthcare options especially for marginalized and vulnerable groups. As underscored by COVID-19, barriers to healthcare provision may have catastrophic, persistent knock-on effects during emergencies.

- Responsive, accountable local authorities are pivotal in actualizing the optimistic scenario for urban futures through investing in urban services that improve the social determinants of health including fostering safety, promoting social cohesion, enhancing living conditions and creating access to decent work and address urban health inequities. To achieve this, cities need sufficient technical capacities and financial resources to develop and implement these holistic, place - based strategies.

Endnotes

1. WHO, 2022d.
2. WHO Regional Office for Europe, 2022.
3. Friel et al, 2011.
4. Crane et al, 2021; Pineo, 2020.
5. Dye, 2008, p.766.
6. Dye, 2008, p.768.
7. UNICEF, 2018, p.3.
8. Whitehead, 1992.
9. Corburn et al, 2020a; United Nations, 2020a; Kabeer et al, 2021.
10. UN-Habitat, 2021a.
11. Plowright et al, 2020.
12. Grace and Jones, 2011.
13. The Lancet, 2019; UNAIDS, 2019.
14. ECDC, 2022.
15. ECDC, 2021.
16. Patz and Siri, 2021; Atwoli et al, 2021.
17. McGranahan et al, 2007.
18. For Dar es Salaam, see Kiunsi, 2013.
19. Gasper et al, 2011.
20. McDonald et al, 2014.
21. Ebi et al, 2021, pp. 703-4.
22. Romanello et al, 2021.
23. Romanello et al. 2021, p.16.
24. WHO, 2021g.
25. Samet, 2019.
26. WHO, 2021h.
27. WHO, 2018b.
28. Tainio et al, 2021.
29. WHO Regional Office for Europe, 2019.
30. Willett et al, 2019, p.447.
31. Willett et al, 2019.
32. GBD 2019 Mental Disor ders Collaborators, 2022.
33. Esponda et al, 2020.
34. Bartlett and Tacoli, 2021.
35. Wang and Otis, 2019.
36. Popkin et al, 2020.
37. Bartlett and Tacoli, 2021, p.5.
38. Tacoli, 2017.
39. Williams et al, 2019.
40. Whitehead, 1992.
41. Rigon and Castán Broto, 2021, p.2.
42. Hogan et al, 2018.
43. Howard et al. 2019.
44. UNICEF, 2018.
45. Noykhovich et al, 2019.
46. Subbaraman et al, 2020.
47. Willett et al, 2019.
48. Earle, 2016.
49. Earle, 2016; Guterres and Spiegel 2012.
50. Cole, 2014.
51. Johnson, 2017.
52. Shaw et.al, 2021.
53. Ezeh et al, 2017; Corburn and Riley 2016.
54. Dodman et al, 2019 ('A spectrum of methods for a spectrum of risk: Generating evidence to understand and reduce urban risk in sub Saharan Africa').
55. Satterthwaite and Bartlett 2017; Vojnovic et al, 2019.
56. Moser, 2011.
57. Boubacar et al, 2017.
58. Reckien et al, 2017.
59. Mohindra and Schrecker, 2013.
60. Baruah 2015; Sovacool, 2011.
61. Subbaraman et al, 2012.
62. Muggah, 2014; Moser and McIlwaine 2014.
63. WHO, 2016.
64. Sommer et al, 2015; Corburn and Karanja 2014.
65. Chant, 2013.
66. Bartlett and Tacoli, 2021.
67. Mberu et al, 2015.
68. Kola et al, 2021.
69. Kola et al, 2021.
70. WHO Rwanda, 2020.
71. City of Kigali, 2020.
72. Zhou and Parmanto 2019.
73. Griffiths et al, 2020.
74. Buttazzoni et al, 2020.
75. United Nations, 2015a.
76. Satterthwaite et al, 2019.
77. Satterthwaite et al, 2019; Beukes, 2015.
78. Wahl et al, 2020.
79. Bhaumik et al, 2020.
80. Feroz et al, 2021.
81. Ludwick et al, 2020.
82. UN-Habitat, 2021a.
83. Bezgrebelna et al, 2021.
84. Baxter et al, 2019.
85. Ewing et al, 2015.
86. Matzopoulos et al, 2020.
87. Sheridan, 2018.
88. GNESD, 2014.
89. Collado and Wang, 2020.
90. Simon, 2015.
91. Simon, 2015, p. 460.
92. Corburn and Griffin, 2019.
93. Sharifi et al, 2021.
94. Sverdlik et al, 2020.
95. Rémillard-Boilard et al, 2021.
96. WHO, 2022c.
97. WHO, 2022a.
98. WHO, 2022b.
99. Reckien et al, 2017.
100. UNAIDS, 2019.
101. UNAIDS, 2019.
102. De Bree et al. 2019; UNAIDS, 2019.
103. The Lancet, 2019.
104. WHO, 2015.
105. UN-Habitat and WHO 2020, p38.
106. Ramírez-Rubio et al. 2019, p17.
107. Van Vliet-Brown et al, 2018.
108. Guglielmin et al. 2018.
109. Van Vliet-Brown et al, 2018.
110. WHO and UN-Habitat, 2016; Diez Roux, 2021.
111. Vojnovic et al, 2019, p. 3.
112. Henson et al, 2020; Lilford et al, 2017; Corburn and Sverdlik, 2017; Collado and Wang, 2020.
113. Corburn et al, 2020; Baruah, 2015; Horn 2021.
114. Atwoli et al, 2021, p. 2.
115. Atwoli et al, 2021, p. 2.
116. Sharifi et al, 2021.
117. Tainio et al, 2021; Sharifi et al, 2021.
118. Lindley et al, 2018.
119. United Nations, 2021a
120. UN-Habitat, 2021a.
121. Gitahi and Cashin 2020, p.1613.
122. WHO and IBRD/World Bank, 2021, pp. vii and 12-14.
123. WHO and IBRD/World Bank, 2021, vi and 30.
124. Vilcu et al. 2016.
125. Watson et al, 2021.
126. Anjorin et al, 2021, pp.7-8.
127. Zakaria, 2020.
128. Independent Panel for Pandemic Preparedness and Response, 2021.
129. WHO, 2021a.
130. Wilkinson, 2020.
131. Crane et al, 2021, p.6.
132. Willett et al, 2019, p.447.
133. Westbury et al, 2021.
134. Tainio et al, 2021; Sharifi et al, 2021.
135. Acuto, 2020; UN-Habitat, 2021a.
136. Razavi et al, 2020.
137. Smith et al, 2021; Kabeer et al, 2021.
138. Smith et al, 2021.
139. ILO, 2018.
140. Chen and Carré, 2020; ILO, 2018.
141. Lund et al, 2016.
142. Bamu and Marchiori, 2020.
143. Kola et al, 2021, p.545.
144. Esponda et al, 2020.
145. Zhang et al, 2019.
146. Kola et al, 2021.

Chapter 8:

Rethinking Urban Governance for the Future of Cities

Quick facts

1. Through the lens of spatial justice, effective multi-level governance plays a key role in ensuring that global shocks like the pandemic do not disproportionately impact vulnerable groups.

2. The Covid-19 pandemic has accelerated the digitalization of urban governance, which provides an opportunity to use new data, but also threatens to increase the digital divide.

3. City diplomacy and international city networks provide an emerging opportunity for cities to contribute learning and experience and adapt governance approaches to their own context.

4. Effective decentralization, local fiscal autonomy, adequate local capacity and links between National Urban Policies and cities have not progressed enough.

5. While many cities are engaging in innovative participatory processes, globally, space for civil society is shrinking.

Policy points

1. In an age of global threats and disruptions, such as pandemics, natural disasters and armed conflicts, urban governance needs to be flexible and adaptable.

2. With cities being more culturally mixed, and with bigger distance between citizens and government, building trust and legitimacy are essential, including protecting data privacy.

3. Governments need to have adequate political and institutional legitimacy, clearly defined roles and need capacity and resources that meet their responsibilities.

4. There is a need for clearer and more decentralized regulatory frameworks to enable more own-source revenue, municipal borrowing and bond-issuance and more regular government transfers.

5. Government must revision their relationship between the private sector and civil society, with special attention to underrepresented groups to co-create strategies such as re-municipalization, community-led finance and forms of co-production of urban services.

Aspiration and opportunity coexist with destitution and disaster as a defining feature of our world. With an estimated 90 per cent of all reported COVID-19 cases, cities were the epicentre of the pandemic.[1] Meanwhile, cities bear the brunt of armed conflict and subsequent displacement, such as the ongoing conflicts in Ethiopia, Myanmar, Syria, Ukraine and Yemen. These crises have made explicitly clear the need for just and effective urban governance. While the pandemic caused harm beyond the ability of governments to manage, it catalysed a sense of urgency and a window of opportunity to reimagine urban governance for more just, green and healthy urban futures.

The global health emergency has reinforced that no local governmental entity, regardless of its level of development or income, can achieve sustainable and resilient urban development in isolation. Indeed, urban governance is not entirely under the purview of local institutions and actors, but also highly influenced by the frameworks and enabling environment set by national governments.[2] Whether and how economic opportunities; supportive social networks; and access to land, infrastructure and services are accessible to the urban poor is largely dependent on the efficacy of urban governance and institutional arrangements. Urban governance remains central to effective crisis response and sustainable urban development.

Chapter 7 of the World Cities Report 2020 discusses the importance of public health for local governments. This chapter augments the discussion on local government by extending the frame of reference to urban governance more broadly. Through the New Urban Agenda, Member States agreed that sound urban governance is a critical tool for people-centred urban development. Such development patterns better protect the planet and are age- and gender-responsive. They also enhance the realization of all human rights and fundamental freedoms, help to end all forms of discrimination and violence, reduce social and economic inequalities, and empower individuals and communities while enabling their full and meaningful participation.[3]

The concept of governance recognizes that power exists inside and outside of the formal institutions of government and that decisions are influenced by the relationships and priorities of multiple actors.[4] In this light, and in line with previous UN-Habitat publications, this chapter defines urban governance as the sum of the many ways in which individuals and institutions, public and private, plan and manage the common affairs of the city, metropolitan area or region.[5]

The chapter progresses as follows: The first section explores key lessons for urban governance from the challenges and systemic disruptions to communication, core functions and service delivery as a result of the COVID-19 pandemic. The second section discusses crucial urban governance approaches that drive and sustain resilient urban futures. Third, through the lens of emerging urban governance challenges, the section reviews current promising governance practices that address each challenge. The fourth section presents divergent urban governance scenarios and the consequences associated with each imagined approach. Finally, the chapter presents concluding remarks and lessons for policy.

8.1. Urban Governance Lessons from a Global Pandemic

How cities responded to the recent COVID-19 pandemic and related shocks indicates flaws in the current model of urbanization. The COVID-19 pandemic provides an opportunity to reflect on how urban governance can evolve to promote a more just, green and healthy future for cities. While many of the lessons of the ongoing pandemic are covered extensively throughout this report, there are unique lessons for governance.

8.1.1. Shocks disproportionately impact vulnerable communities

The pandemic exposed and amplified several long-standing urban inequalities in public health, housing and working conditions that cause disproportionate impacts on vulnerable and marginalized populations,[6] who have less capacity to adhere to public health and social measures.[7] Decisions made at the national or provincial level to limit the spread of COVID-19 through lockdowns and curfews left municipal leaders in the difficult position to enforce policies that were both unmanageable and detrimental to urban residents without adequate housing.

Urban governance responses to the pandemic varied around the world in their effectiveness for vulnerable populations, but included several commonly enacted pro-poor policies. City authorities promulgated rent freezes, eviction moratoria and bans on demolishing informal settlements that in many instances lasted for the duration of the health crisis. These crucial governance decisions attempted to mitigate the disproportionate impacts the pandemic had on vulnerable communities. Given both the common nature of the threat and the need to act quickly, effective governance responses to the COVID-19 pandemic included city networking initiatives

CLOSED message board near bar, cafe, shop on empty street.. © Corona Borealis Studio/Shutterstock

like Cities for Global Health, in which United Cities and Local Governments (UCLG), Metropolis and UN-Habitat collaborated to set up a knowledge exchange platform for cities to share their protocols, plans and intitiaties.[8] Such city networks are elaborated on in section 8.2.3.

When city authorities acted to protest vulnerable communities, they were pursuing "spatial justice," the spatial version of social justice, which strives to realize the fair distribution of burdens and benefits of urban development across geographic spaces. This complementary idea to the more broadly known "right to the city" is a response to the inequality embedded within urban planning and the built environment globally, regionally and locally.[9] Beyond the temporary measures taken at the onset of the pandemic, a spatial justice approach requires more targeted action including pro-poor decisions around zoning rules and spatial planning processes, the acquisition of land for urban redevelopment programs, affordable housing development, slum upgrading, relocation of vulnerable communities and provision of access to urban amenities and services.[10]

A spatial justice approach promises that planning can function as a tool for the fair redistribution of burdens and benefits from urban development

A spatial justice approach promises that planning can function as a tool for the fair redistribution of burdens and benefits from urban development. Through procedural dimensions like participatory budgeting and decision-making, a spatial justice approach can also strengthen democracy and the public sphere. For cities to avoid the high damage scenario noted in Chapter 1, local governments must invest in infrastructure where new development and informal growth is occurring and address vulnerable residents' specific needs.

8.1.2. Data matters

The COVID-19 pandemic has demonstrated the value of high-quality individualized data for public health measures like contact tracing and for research purposes like evaluating the effectiveness of specific virus containment measures.[11] While countries mobilized quickly to repurpose emerging data sources (i.e. mobile phone records) to monitor viral spread and public behaviour, they have simultaneously struggled to protect against privacy concerns and the risk of misuse.[12] There are two key data governance lessons that emerged from the pandemic.

First, deficits in the quality and quantity of high-value data exist throughout cities globally and are accentuated within cities in low- and middle- income countries, which can obscure certain populations even as decision-makers push forward with crisis response and investment decisions.

However, as the World Data Report 2021 states, simply gathering more data is not the answer, if data is not effectively linked to improve development outcomes. Global examples include the use of global spatial location from mobile phones, social media and online search data to predict and trace viral outbreaks as well as the use of online media and user-generated content to map flood events in real time for water management and food security.[13]

Second, access to private and public data is necessary for urban governance institutions to coordinate emergency responses that are grounded in data, geospatial mapping and real-time analysis of conditions.[14] Data governance considers who makes decisions, how they are made and how the decision-makers are held accountable in the collection, use, sharing and control of urban governance data, which is often owned by various institutions. Data governance systems are needed to ensure data is available to inform policies and actions from city and territorial initiatives to national strategies and multilateral cooperation while continuing to maintain privacy and security.[15]

Chapter 9 explores the various technologies available for urban governance and their associated risks while revealing the need for data governance amongst key stakeholders. Uruguay's whole-of-government data governance approach highlights the benefits of institutionalizing governance arrangements and adopting legislation and regulations to complement infrastructure and technology investments.[16] Similarly, the Netherlands created Urban Data Centres as a partnership between the country's national statistical office and local governments in order to enable data sharing in a way that maintains data integrity and privacy for residents.[17] At the international level, organizations such as the OECD and the United Nations Economic Commission for Europe (UNECE) have supported efforts by national and local governments to collect, analyse and make evidence-informed decisions for urban governance through the creation of subnational indicators for the Global Goals.[18]

8.1.3. Beyond response: preparation and prevention

The COVID-19 pandemic emphasized the need for effective governance to manage risk, including investments and frameworks for preparation and prevention. The Sendai Framework for Disaster Risk Reduction recognizes the need to strengthen governance in risk reduction strategies in order to improve preparedness, enhance coordination and leverage the recovery process to "Build Back Better."[19] The pandemic taught us the importance of embedding climate and public health measures into national urban policies in order to enhance the ambition and accountability of government.[20] For example, Rwanda's 2015 National Urbanization Policy provided the basis for more balanced development in the urban-rural continuum, promoting sustainable agricultural practices, and lowering urban sprawl into protected nature zones.

Evidence from the COVID-19 pandemic suggests that pre-existing institutionalized governance mechanisms have advantages over ad hoc bodies formed for emergency purposes.[21] Indeed, governments that initiated preparation and prevention planning as a result of prior emergencies were better equipped to respond to COVID-19. For example, Viet Nam's response was informed by previous encounters with SARS (2003) and avian influenza (2004 and 2010). These past experiences led to a whole-of-government and whole-of-society approach that includes strong central coordination, mobilizing neighbourhoods and engaging multi-sectoral stakeholders in decision-making, in addition to a well-developed public health system, emergency operations centres and contact tracing systems.[22] Despite the apparent benefits of models like Viet Nam, many countries did not use existing institutions and created parallel structures instead.[23] A key lesson emerging from the COVID-19 pandemic for urban governance is the importance of investing in preparedness by developing the economic, social, environmental and institutional resilience to respond to a wide range of shocks, including having contingency plans for the most vulnerable groups.[24]

8.2. Urban Governance that Drives and Sustains Urban Futures

Current modes of urbanization are environmentally, socially and economically unsustainable,[25] thus diminishing the inherent value of urbanization.[26] Top-down and centralized forms of government, which are still prevalent, have significant limitations in their ability to address societal and governance challenges in complex urban systems. As recognized in Chapter 7 of the UN-Habitat World Cities Report 2020, relationships between national, subnational and local governments need to be more integrated and collaborative, with an emphasis on institutionalized yet flexible and innovative frameworks for effective implementation of the Sustainable Development Goals and the New Urban Agenda.

8.2.1. Governing for, and with, new digital technology

Emerging and existing smart technologies require similarly smart and adaptive governance. New technologies for communication, core services, data collection and resident engagement are reshaping urban governance and can be harnessed to achieve sustainable urban futures. For at least a

decade, city authorities have been integrating more open and inclusive forms of smart city technology in order to improve urban governance, decision-making and service provision. Chapter 9 discusses the breadth of new technologies used in urban governance across all sectors like water, sanitation, waste management and environmental management. The focus here is narrower, specifically the pandemic-induced acceleration of the global transition toward public-facing technologies.

Undoubtedly, the impact of digital technology will be uneven across cities in low-income countries, but the availability of geospatial technologies and the resultant data will influence governance even in the most remote urban areas. Recent empirical case studies from rural districts in Bangladesh to urban areas in Zimbabwe and Uganda highlight the ubiquitous impacts of new technologies.[27] Emergency notifications, health-check apps, and WhatsApp-based information bots have become prominent features of government operations around the world. The most effective technologies for urban governance will emerge from locally-identified needs and within the context where it will be used. For example, after repeated challenges with externally-developed platforms, Mutare, Zimbabwe, engaged in a partnership with the Harare Institute of Technology to pilot the Local Authorities Database System. One of the components of the system was an innovative chatbot built within WhatsApp, the success of which is credited to multilevel governance (Box 8.1).

As Chapter 9 explores, COVID-19 exacerbated the digital divide by shifting employment, schooling and social life into the virtual environment. The emerging digital divide presents an issue of governance, particularly in providing universal access and maintaining affordability. Only 47 per cent of people in developing countries and 19 per cent of people in least developed countries have internet access.[28] However, the digital divide is not just a low-income country challenge, but also a disparity between affluent and poorer residents in higher-income countries. For example, the NYC Internet Master Plan states that 46 per cent of New York City households living in poverty do not have broadband at home and 18 per cent (more than 1.5 million residents) do not have home or mobile connection.[29]

Additionally, the digital divide also has a social component, as women are disproportionately excluded from access to digital tools and platforms, with men being 21 per cent more likely to be online than women globally, increasing to 51 per cent more likely in least developed countries.[30] The gender disparity also has an economic impact with countries missing out on an estimated US$126 million in GDP in 2020 as a result of the limitations and exclusion of women from digital access.[31] Over 40 per cent of countries do not demonstrate meaningful policy actions to close the gendered divide.[32] The Alliance for Affordable Internet has developed the REACT Framework, which highlights five domains for policy development aimed at eliminating the gendered digital divide (Figure 8.1).[33] "Open smart cities" is an emerging framework that guides the use of new technologies in cities and strives to ensure all actors, including urban residents, collaborate in mobilizing data and technologies to develop their communities through fair, ethical and transparent governance that balances economic development, social progress and environmental

Box 8.1: Chatbot initiative in Mutare, Zimbabwe

Similar to governments around the world, the challenges of COVID-19 overwhelmed the ability of the local government in Mutare to deal with incoming service requests while maintaining physical distancing recommendations. To manage resident needs for official services, the city of Mutare developed an intelligent chatbot called Taurai Katsekaera to provide services such as bill payments, service requests, balance inquiries, waiting list applications, complaints and payment plan services. The chatbot, attached to a larger systemwide digital platform, allowed for real-time access to services without in-person visits. These visits could be leveraged to increase risk awareness among urban residents in the longer term, just like health and prevention measures could provide the foundation for better sanitation practices across cities. The implementation of the chatbot was supported by the central government, developed by a local academic institution and piloted in Mutare with the intention of scaling across Zimbabwe.

Source: Chatwin, 2022.

Figure 8.1: Alliance for Affordable Internet REACT Framework

responsibility. An example that reflects this framework is an initiative in India to set up free high-speed Wi-Fi hotspots in areas such as bus stops, hospitals and railway stations.[34] Cities across Canada are exploring ways to address the growing digital divide through free public Wi-Fi and distribution of computer equipment to ensure that residents are able to participate fully in society.[35]

8.2.2. Improving multilevel governance

Effective multilevel governance is embedded within the New Urban Agenda and is instrumental to achieve the Sustainable Development Goals. For cities to attain the optimistic scenario indicated in Chapter 1, a whole-of-government approach is needed, which would ensure that policymakers "get [the] political economy right to avoid piece-meal policymaking leading to both unfilled promises and unintended consequences."[36] Multilevel governance describes how power is spread vertically between multiple levels of government and horizontally across quasi-government and non-governmental organizations and actors.

Chapter 7 of the World Cities Report 2020 examined the global trend toward decentralization, which according to the OECD is among the most important governance reforms of the past 50 years.[37] Decentralization is not an end in itself, but rather a means to achieve greater political accountability and more efficient delivery of services. Multilevel governance within countries relies on a balance between decentralization and central control. It involves three interdependent dimensions: political, administrative and fiscal.

Effective decentralization requires a clarification of roles based on the level of government best positioned to be effective, meaning subsidiarity must be the guiding principle. COVID-19 reinforced this imperative and stresses the need for a clear identification of who does what, at which scale, and how. Without this clarification, complexity in the distribution of responsibilities leads to competing and overlapping competences, thus resulting in institutional wars and a lack of accountability. In several countries from Asia-Pacific such as Australia, Malaysia, Korea, Japan and the Philippines, there is a frequent overlap in responsibilities both vertically and horizontally.[38] In contrast, the Council of Australian Governments, the Local Government Commission in New Zealand, the Union of Local Authorities in the Philippines and the Municipalities Unions in Turkey developed multilevel governance mechanisms that formalize role differentiation.

Globally, multilevel governance is most effective in countries with higher degrees of decentralization that have entrenched processes for spatial planning, climate adaptation and mitigation, infrastructure and transport, and technology.[39] Decentralization, in addition to being a critical factor for multilevel governance, equips local governments to respond to the needs and desires of residents within crisis situations and beyond. For example, Gauteng province in South Africa institutionalized coordination mechanisms for emergency response, which enables high levels of data collection and analysis as well as flexible approaches to emergency budgeting in order to rapidly address local vulnerabilities.[40] Though local action is central to realizing the SDGs, national government is not irrelevant in the design and implementation of local transformations. On the contrary, national government action is crucial to create enabling macroeconomic policies, streamline institutional environments and effectively devolve authority to local levels for contextual implementation. Effective decentralization can only be realized if fiscal authority is reconciled with the delivery of functions expected from local governments by their national governments. The limited fiscal autonomy of local governments, dependency on central government fiscal transfers, and competition for resources between subnational governments are factors that limit effective decentralization. More detail on fiscal decentralization can be found in section 8.2.6.

Effective decentralization requires a clarification of roles based on the level of government best positioned to be effective

Multilevel governance also includes horizontal cooperation between cities and local governments along the urban-rural continuum. Urban challenges do not recognize jurisdictional boundaries and often require the pooling of resources and expertise, particularly in extended urban agglomerations.[41] Further, the nonlinear and intersectional influences of trade, migration, water supplies, air quality and food security necessitate coordination between cities, regions and territories. For example, the Jing-Jin-Ji metropolitan region that encompasses Beijing, Tianjin and Hebei in China has been instrumental in addressing the region's environmental problems, particularly air pollution.[42]

Evidence suggests that metropolitan areas with institutionalized frameworks are more likely to optimize their coordination, provide timely outreach to the whole population, and include rural communities in their mitigation, adaptation and recovery measures in response to shocks.[43] One such approach is a multi-stakeholder engagement process that uses an inclusive and participatory approach to develop partnerships that promote a greater sense of ownership over the pursuit and realization of desired outcomes.[44] Another approach is the United Nations Development Programme ART Global Initiative (Articulation of Territorial and Thematic Networks of Cooperation for Human Development), whose methodology supports the strengthening and expansion of linkages for knowledge sharing and joint strategy formulation for local and regional governments.

Plurality defines the future of metropolitan governance as it takes different forms across the world. Metropolitan governance in Europe and the Americas often focusses on polycentric governance networks and involves less structural change. The number of metropolitan governance authorities in the OECD has increased over the past decades with over two-thirds of the metropolitan areas having an institutionalized governance body, like the Valle de Aburrá in Colombia (Box 8.2).[45] By contrast, metropolitan governance in many Asian countries relies on a strong central and local government, in which vertical integration takes precedence over horizontal interactions between governments and non-state actors.[46] In China, central government, rather than cities, often take the initiative for metropolitan governance as they upscale governance from individual cities to city regions.[47] In several countries across Africa and Central Asia, including Azerbaijan, Kyrgyzstan, Senegal and Benin, among others, metropolitan governance is promoted in the constitution.[48]

Metropolitan governance can be arranged in at least four different ways (Figure 8.2).[49] Of these schemes, the most common is voluntary cooperation among municipalities without any regulatory powers.[50] While voluntary metropolitan associations can be limited in their ability to achieve consensus on regional action due to their lack of binding authority, inter-municipal cooperation mechanisms between large central cities and surrounding suburbs create associative schemes that include the oft-forgotten needs and perspectives of smaller municipalities on the urban periphery.[51]

The success of these metropolitan cooperation mechanisms is largely dependent on enabling environments that include

Bangkok, Thailand © Shutterstock

clear fiscal and administrative structures. Establishing their political legitimacy remains one of the biggest obstacles to metropolitan governance.[52] Metropolitan governance reforms are challenged by conflicting interests, competing aims, reduced planning and development responsibilities, and less fiscal and borrowing autonomy than that which is present in individual cities.[53] Currently, many metropolitan structures are fiscally dependent on the participating local governments and require consensus building. A promising example comes out of France, a country with a long tradition of institutionalized inter-municipal cooperation, in which all municipalities are part of an inter-municipal structure with an own-source tax, forming a fourth level of quasi-government.[54] Similarly, Sri Lanka has articulated an urban vision for competitive, environmentally sustainable and well-linked cities, by connecting the countries five metro regions with district and provincial capitals and towns.[55]

Figure 8.2: Different kinds of metropolitan governance arrangements

Inter-municipal cooperation mechanisms

Established as horizontal cooperation among the local governments

Examples:
Many cities in Brazil; Ruhr, Germany; Turin and Milan, Italy; Paris, France; Greater Toronto, Canada; Los Angeles County, USA; Valle de Aburra, Columbia.

Consolidated local governement

Established through amalgamation of local governments or annexation of territory

Example:
Municipalities in South Africa; Turkey, City States(Singapore)

Metropolitan and regional authorities

Established through voluntary organization

Type A:
Metropolitan Council of govenments

Examples:
Sao Paulo, Brazil ; Bologna,Italy;Montreal, Canada; numerus examples in the United States.

Type B:
Planning & Service Delivery Authority

Examples:
Canadian examples such as Greater Vancouver Regional Service District (GVRSD) and Metropolitan Transport Authority (ARTM) in Montreal . Lyon and Marseille, France; Lagos Mega-City Development Authority, Nigeria; "Developemnt agencies" in Delhi, India and Dhaka, Bangladesh.

Metropolitan or regional government

Established as a separate metropoliitan local government for coordination/ selective fucntions(type A) or established by a higher level government for metropolitan area (type B)

Type A:
A higher -level metropolitan local government

Examples:
Quito, Ecuador, Dar es Salaam, Tanzania; Abidjan, Cote d'Ivoire(until 2001); Barcelona, Spain; London, UK; Budapest,Hungary; Stuttgart, Germany;Toronto, Canada(1954-98); Portland, USC; Shanghai(all large Chinese cities)

Type B:
Regional government

Examples:
Abndjan, Cote d'Ivoire (from 2001); Madrid, Spain;Manila,Philippines

Source: GIZ and UN-Habitat, 2015.

Box 8.2: Metropolitan governance in Valle de Aburrá, Colombia

The Metropolitan Area of Valle de Aburrá (AMVA) was established in 1980 and is composed of Medellín and nine other municipalities, home to 4 million people. The AMVA is governed by a metropolitan board, composed of the mayor of Medellín, the mayors of the other member municipalities, and various councilors and representatives from NGOs and the national government. The AMVA has adopted more than 150 metropolitan agreements over the last 10 years covering metropolitan public policies, territorial plans, financing mechanisms, budgets and administrative decisions in areas including transport, environment and security.

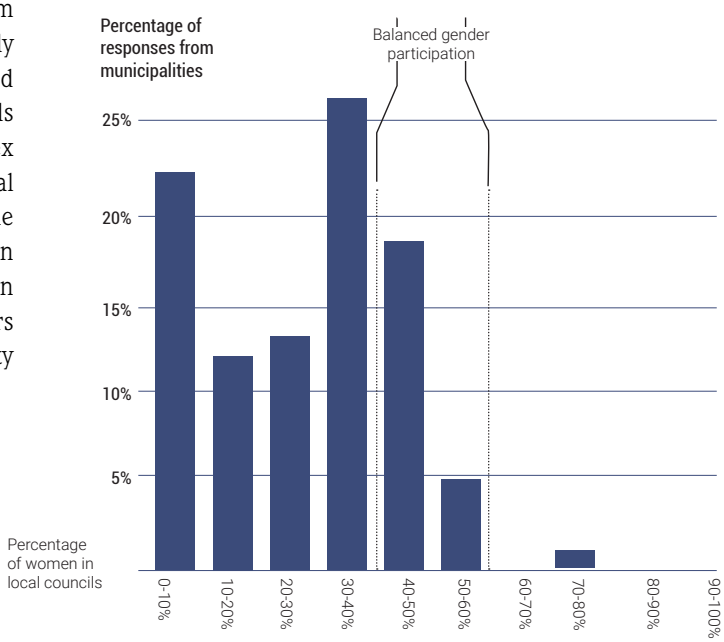
The AMVA's main functions include integrated sustainable metropolitan development through infrastructure like public spaces, social facilities and housing as well as the management of metropolitan public transport. To enable these roles, the AMVA has adopted a development vision with medium- and long-term horizons, including a long-term development strategy entitled Metrópoli 2050: The Supercity of Medellín. Another important role of the AMVA is environmental management. For example, the AMVA recently adopted a metropolitan plan on air quality that links all stakeholders and commits them to meet goals for reducing polluting emissions. To support the processes of institutional management and regional planning, the AMVA also launched an observatory to monitor and visualize indicators on a range of strategic issues within the metropolitan area.

Source: UN-Habitat, 2020b.

The future of effective multilevel governance must be attentive to the equitable representation of women. From a survey of 127 cities (self-reporting), it emerged that only a very small percentage of municipalities have balanced participation between men and women in their local councils (Figure 8.3).[56] However, in recent years, the Ibrahim Index of African Governance notes a positive trend in the political power and representation of women in Africa.[57] The most progressive forms of empowerment of women often come from civil society, such as the self-help organization Kudumbashree, which has over 4 million female members and played an instrumental role in removing absolute poverty from the state of Kerala, India.[58]

The future of effective multilevel governance must be attentive to the equitable representation of women

Figure 8.3: Women in local councils



Data sourced from the Urban Governance Survey developed by LSE Cities, UN-Habitat, and UCLG (2016)

Furniture shop in Kerala, India.
© Kerstin Milhann/ UN- Habitat

For cities to escape the pessimistic scenario described in Chapter 1, effective multilevel governance also needs to acknowledge and work with various forms of parallel governance in cities. Parallel governance may emerge when governments cannot provide the urban services that residents need, if the quality of those services is lacking, or if the transaction costs of access to those services is too great.[59] The largest non-governmental development organization in the world, BRAC, fulfils many government roles traditionally associated with the government, and has become the main provider of services in small towns in Bangladesh.[60]

Parallel governance often emerges out of traditional governance and relies strongly on informal patron-client networks.[61] In the African context, traditional leaders often play an important role in regards to land allocation in the urban periphery and are often more accessible to residents than elected politicians.[62] In Old Fadama, one of the largest slums in Accra, Ghana, the local association of community leaders has assumed tasks that the government has failed to implement, such as setting rules to reduce the risks of fire or flooding.[63] While violations of planning regulations that promote sustainable urbanism are often seen as a failure of implementation or a result of corruption, they often originate from conflicting sets of parallel governance.[64]

8.2.3 International networks for city cooperation and learning

From driving global prosperity to achieving the Sustainable Development Goals and advancing the New Urban Agenda, local governments are integral to building a better world. This positions cities and its leaders at the forefront of sustainable development.[65] Cities have nevertheless found themselves ill-prepared and lacking the political, fiscal and administrative capacities to adequately respond to pressing global challenges like rising urban poverty, massive inequalities, public health emergencies and the looming climate crisis.[66] With 93 per cent of COVID-19 cases reported in cities at the end of 2020, the COVID-19 pandemic is a vivid illustration of how cities are vulnerable to external shocks.[67] Without appropriate tools, cities struggle to respond to future shocks and stresses, especially in poor countries. Global partnerships can help strengthen the capacity of national and local governments, such as the lack of trained urban planners. While developed countries have 1 planner for every 1,000–3,000 people, developing countries such as Indonesia have just 1 planner for every 80,000 people. Online open access learning materials and peer-to-peer learning and mentoring have emerged both nationally and internationally.

Professional associations that are interested in a rights-based approach to sustainable urban development can consider involving underrepresented groups such as youth, women and minority groups in their governance and decision-making. This type of effort requires a commitment of these associations on behalf of their members to be aware of and integrate global commitments into their culture and advocate for the rights of residents to be involved in urban planning and development processes.[68]

City diplomacy is reconfiguring international politics as cities engage in external relations on an international stage with the aim of representing themselves and their interests. Higher representation raises political visibility, facilitates policy negotiations, and increases the possibility of acquiring more resources and knowledge for policy action.[69] These international cooperation opportunities expose participants to the art of the possible. They can discuss common barriers and share their experiences of how to work through or overcome them.

The rise of city diplomacy has manifested in the snowballing of local government networks, often in collaboration with civil society and international organizations. Formal networks include C40 Cities, United Cities and Local Governments, ICLEI–Local Governments for Sustainability, Metropolis–World Association of the Major Metropolises, Global Resilient Cities Network, OECD Champion Mayors for Inclusive Growth and Mayors Migration Council, among others.[70] While in 1985 there were just 55 city networks, today there are over 200 with multiple sub-groups emerging from the parent networks as well.[71] The COVID-19 pandemic pivoted the focus of many city networks to issues of health and pandemic response.[72]

These networks can be far-reaching with on-the-ground impact. For example, since 2011, 1 in 12 people globally have been affected by nearly 10,000 climate and sustainability initiatives that came from C40 Cities.[73] The Making Cities Resilient 2030 Platform currently hosts 500 cities representing over 262 million residents.[74] This platform fosters peer-to-peer learning and helps cities fill the gap in order to build their resilience in financing, capacity building or tools for developing a more robust risk management framework. The Federation of Canadian Municipalities' international programming has helped Canadian local elected officials and staff share knowledge and build relationships with their counterparts in Asia, Africa, the Middle East, Latin America, the Caribbean and Eastern Europe.[75] As Chapter 5 highlighted, addressing climate change effectively, requires building global urban partnerships.

The rise of city diplomacy has not been a straightforward process but rather is characterized by uncertainty on the level of recognition and participation of local governments. The Second United Nations Conference on Human Settlements (Habitat II) held in 1996 is remembered as groundbreaking in terms of the participation of local authorities, the private sector, NGOs and other development partners in the design and implementation of the Habitat Agenda.[76] Yet, in 2000, with the adoption of the Millennium Development Goals, the international community was silent on the role that local governments should play. This situation changed more in the transition to and the adoption of the Sustainable Development Goals when a wide coalition of organizations supported a so-called urban goal, which culminated in the endorsement of SDG11.[77]

While many dimensions of the SDGs require action at the local level, national governments adopted the 2030 Agenda for Sustainable Development. Consequently, national governments are responsible for reporting their progress toward the goals in a process known as the voluntary national review (VNR). To complement VNRs, some local governments, starting with New York City, prepare voluntary local reviews (VLR) as a global tool for cities to report on their progress towards the SDGs and the Paris Agreement.[78] While some Member States' commitment to achieve their global commitments is insufficient, the VLR process has demonstrated that cities are more than willing to lead the way. For example, in Europe, less than 10 per cent of the Member States have submitted VNRs by 2021, while the region has the highest number of VLRs.

These reviews highlight the willingness of local, regional and national governments to engage in the global agenda and can act as an entry point to strengthen institutional capabilities.[79] At present, only 40 per cent of local governments co-create their VLRs with their national governments.[80] Strengthening the co-creation of VLRs could therefore provide a low-hanging fruit in making progress on better coordinated action to achieve the SDGs. While the VLRs emerged out of, and are prevalent in, situations of mismatched national and local government priorities, Finland used the VLR to revitalize multilevel dialogue to inform and update their national review in line with key drivers of the New Urban Agenda. The VLR process has also demonstrated its value in developing countries, as evidenced in the city of Freetown, Sierra Leone, which used a VLR as a tool to map the synergies between local development targets and the SDGs.[81] Globally, 106 subnational governments submitted VLRs by October 2021 and 230 cities are signatories on the New York City Voluntary Local Review Declaration.[82]

8.2.4. Co-production: integrating the experiences and resources of non-governmental institutions

Governments are not solely responsible for urban development, planning and implementation.[83] No local government, regardless of the income and development level, can address all urban challenges in isolation. Accordingly, urban governance involves a plurality of public and private stakeholders, and should be cross-sectoral, including private companies, civil society, community associations, local residents and youth-led organizations. Co-production describes the idea that cities are produced through the intersection of different actors and that service delivery benefits from forms of shared ownership and joint knowledge production.[84]

Formalized relationships between government and civil society strengthens communities, particularly those who are underrepresented, poor or living in informal settlements. Parallel governance structures, as elaborated on in section 8.2.2, can be incorporated into the government. The Communist Party of China has advanced deeply into grassroots society and developed relations with non-governmental organizations.[85] One approach emerging globally are local strategic partnerships that bring together a broad network of non-governmental organizations to define effective community-led projects with a proactive approach to improve the quality of life of individuals and communities within their jurisdiction.[86] Examples include Regional Innovation Councils in Norway and Medical Innovation Centres in the Czech Republic.

These collaborations bring together cities, universities, non-governmental organizations and businesses to promote innovation.[87] An excellent example of formalized relationships with civil society from the developing world, is the aforementioned Kudumbashree, which operates as a federation of self-help groups that is led by the government of Kerala.[88] Kudumbashree also provides a cautionary tale in integrating non-governmental organizations, as during India's Jawaharlal Nehru National Urban Renewal Mission, the government

The future of urban governance needs to ensure regulation better reflects the different roles civil society plays in society

burdened the NGO with responsibilities that outstripped its capabilities.[89] As civil society assumes different roles – as service providers, agents for civic engagement, enforcers of social accountability and financiers through philanthropy – the

future of urban governance needs to ensure regulation better reflects the different roles civil society plays in society.[90]

Within national guidelines, local and territorial governments are largely responsible for creating the enabling environment for collaborative governance with adjacent jurisdictions and non-governmental actors. Indeed, one of the areas of biggest innovation in response to COVID-19 was cooperation and collaboration across key urban stakeholders including the introduction of effective measures to facilitate joint action between actors from the public sector, private sector, civil society organizations and community associations.[91] For example, Madrid, Spain, challenged local start-ups to develop innovative solutions that addressed the impacts of the pandemic, find solutions to increase the connectivity of residents with special needs.[92] In Kenya, a collaboration between local government and a number of international and private organizations partnered to establish the Youth-led COVID-19 Emergency Response Coalition which established hygiene stations, isolation centres and education programs in informal settlements across the country.[93]

Another expression of co-production is the emergence of living labs or city labs (Box 8.3), which are platforms where a plurality of stakeholders, often with conflicting opinions, co-create projects, foster innovation and build capacity through experimentation. The Baltic Urban Lab project for example experimented with a "public-private-people partnership" approach for the redevelopment of brownfield sites in participant cities.[94]

The institutionalization of collaboration between government and non-governmental actors is important for building trust, understanding and a commitment to collaboration. For instance, civil society organizations can connect with marginalized residents that do not trust local authorities. In Canada, this plays out in the relationships between urban indigenous populations and local governments. For over a decade, the city of Hamilton, Canada has provided block funding directly to indigenous-serving organizations to identify and address community needs.[95]

Box 8.3: Living Labs: Capacity building through experimentation

A living lab is an experimental site where "active and collaborative people can meet other interested actors and work together towards innovative solutions to public problems."[96] First established at the Massachusetts Institute of Technology, the living lab concept has been spreading globally.[97] While the European Network of Living Labs only had 20 members in 2006, by 2020 it noted 474 registered living labs across Europe, as well as examples in other countries such as the Smart Safety Living Lab in the Republic of Korea or the Future Self Living Lab in Australia.[98] By putting conflict front and centre and equipping participants with a "license to fail," living labs respond to a key challenge for participatory urban development, namely that different actors can have highly conflicting viewpoints.

Visitors at De Ceuvel Amsterdam, Netherlands. © https://deceuvel.nl/

A particularly noteworthy living lab is De Ceuvel in Amsterdam, a once polluted site at a former shipyard that has become a "cleantech playground" where social enterprises experiment with circular economy ventures like aquaponics, solar energy, biofilters and composting toilets. The city of Amsterdam awarded four plots via tender with a mandate to clean up the site. At its pre-pandemic peak, De Ceuvel saw over 35,000 visitors annually and has received numerous design and sustainability awards[99]. Future tenants and volunteers participated in the construction process, which generated a sense of community.[100]

"Re-municipalization" captures the trend of governments reversing the privatization trend of the 1980s and taking back ownership of assets and services that had previously been outsourced

As Chapter 5 of this report described, co-production of urban services with the involvement of public actors and citizen groups can overcome persistent challenges. Many governments are indeed revisioning their relationship with private service providers, and are returning public service provision to municipal control, especially in urban contexts where the privatization of public goods has hindered access by low-income households.

The term "re-municipalization" captures the trend of governments reversing the privatization trend of the 1980s and taking back ownership of assets and services that had previously been outsourced.[101] Re-municipalization is often associated with the water and energy sector,[102] but re-municipalization extends to transportation, waste management, cleaning, housing, childcare and other broad service delivery areas.[103] Such re-municipalization is often supported by labour unions, civil society organizations and community associations.[104] In fact, many flagship re-municipalization efforts in France have given seats on the boards of the new public operators to residents and civil society representatives.[105] Barcelona was a signatory with nine other Spanish cities in the Declaration for the Public Management of Water, which broadly states that the cities will assume the responsibility for the provision of and the protection of water as a common good.[106]

Re-municipalization is not mere change in ownership. Rather it is a new form of urban governance that reflects collective aspirations for social and environmental justice and the democratic management of public services.[107] The Barcelona en Comú coalition, which has governed Barcelona since 2015, distilled these aspirations into a political philosophy called "municipalism," in which cities are at the forefront of addressing social, political and environmental challenges through concrete public-led and feminist solutions. In the latest manifestation of city-to-city diplomacy as outlined in section 8.2., Barcelona en Comú now has a network of 50 municipalist organizations from 19 countries.[108]

Over the last 20 years, re-municipalization has been documented in 1,600 cities in 45 countries.[109] Europe is at the forefront of this movement, but examples can be found globally. Paris is a well-known example having reverted water service back to public ownership in 2010 and developing partnerships with public service providers in Morocco, Mauritania and Cambodia.[110] However, challenges to re-municipalization remain; austerity measures have forced some governments to abandon plans for re-municipalization, and resistance from powerful multilateral actors make it difficult to sustain as a coherent policy movement.[111] The city of Berlin provides an instructive case of the lengths that private forces will go to resist re-municipalization as private providers fought for a significant financial compensation from the government and in doing so imposed a large burden on the new public operators and residents.[112]

It has become more difficult for non-governmental organizations to establish and operate freely without repression or persecution

Effective governance for better services and urban development often emerge outside of formal procedures and official administrative structures and bodies. A salient example is the support given by local and international civil society organizations that advocate for the rights of slum dwellers such as the People's Dialogue on Human Settlements, Centre on Housing Rights and Evictions, Ghana Federation for the Urban Poor and the Shack/Slum Dwellers International.[113] These organizations, in addition to bridging the gap between the state and excluded groups through participative mechanisms, can also advocate for human rights, rule of law, equal justice for all and collective action towards common goals.[114]

Unfortunately, the reality on the ground does not always reflect an environment conducive to collaboration between government and non-governmental actors. It has become more difficult for non-governmental organizations to establish and operate freely without repression or persecution.

The Bertelsmann Transformation Index (BTI), which traces processes toward democracy, has for the first time since 2004 recorded more autocratic states than democracies around the world.[115] The 2021 annual assessment by Freedom House of political rights and civil liberties documented the biggest democratic deterioration since 2006, with political rights and civil liberties declining in 73 countries, representing 75 per cent of the global population.[116] According to the Varieties of Democracy research group, civil society across the G20 countries has deteriorated.[117] The Mo Ibrahim Report states that the African continent has been going through an erosion of civil society and the pandemic has worsened the situation.[118] Indeed, 38 countries in Africa have seen their civic space deteriorate and only 15 have seen an improvement.[119] The CIVICUS Monitor, which annually tracks the rights of civil society organizations in each country, highlights that only 4 per cent of the world's population lives in countries where the rights of civil society organizations to operate freely are widely respected.[120] For example in Latin America, the National Council of Cities in Brazil, a multi-sectoral and participatory platform for urban policymaking, was recently abolished.[121]

Cities in particular, are places where civil liberties are tested, when people voice dissent through protests or challenge government practices through other disapproving behaviour. People living in cities are more likely to translate dissatisfaction with service delivery into discontent with their government than citizens further out on the urban periphery.[122]

Despite unwelcoming environments, civil society organizations continue to demonstrate creative ways to participate in civic issues and advocate for the rights of vulnerable populations. In South Sudan, civil society organizations use elements of performance art and theatre to demonstrate how to hold those in power accountable.[123] In Palestine, civil society organizations use theatre to encourage participation in political processes. In the Democratic Republic of the Congo, civil society organizations held an election for the leaders of a new network to demonstrate that it was possible to hold an election despite repeated delays from the government.[124]

8.2.5. Creating opportunities for meaningful resident participation

Despite the challenging context for civil society highlighted in the prior section, meaningful civic participation is closely linked to achieving SDG 1 (no poverty), SDG 3 (good health and well-being), SDG 10 (reduced inequalities) and SDG 17 (partnerships for the SDGs).[125] The New Urban Agenda aims to move beyond perfunctory participation and towards urban governance that identifies residents and communities as important agents of the economic and social development of cities. This transformation requires a revision of established financial mechanisms to position communities as expert actors in the urban development process.[126] The upgrading of the Ga Mashie district in Accra provides a good example of how residents were enabled to take charge of the improvement of their own neighbourhood (Box 8.4). When residents contribute to urban strategies it positively affects the success of initiatives, particularly in the implementation phase.[127]

Many urban areas suffer from an imbalance of political power and insufficient inclusiveness and participation. Women, youth, minorities and the urban poor are often excluded from decision-making.[128] Across Africa, resident participation has deteriorated significantly over the period of 2015–2019, with more than half of the countries following a negative trajectory.[129] This deterioration disproportionately impacts women who already face barriers to participation. In fact, the guarantee of civil liberties to African women has continued to deteriorate substantially since 2015.[130]

Meaningful participation between residents and their respective local governments requires an investment of time and relationship development. Participation can be driven by a need of the local government to generate better policies or earn legitimacy for its decisions, but also as an attempt to bring social movements into the state apparatus and reinvent participatory structures to pursue transformative aspirations.[131] However, state-initiated participation is often disregarded in crisis situations. In the future scenarios facing cities, as described in chapter 1, much of the policymaking will take place in crisis situations, thus causing a conflict between those in power and the public.[132] Online participation, which became popular during the COVID-19 pandemic, has strengths and drawbacks. It can widen access to residents who could not previously attend in-person gatherings, but it can also be co-opted by non-democratic urban governance forces. In this scenario, the public is presented with alternatives that have been

Box 8.4: How community participation built new roads for Old Accra

Under the aegis of UN-Habitat's Participatory Slum Upgrading Programme (PSUP), the old town of Accra has been upgraded since 2008 through community participation in three different ways. First, the community was closely involved in setting the goals for the upgrading, namely improvement of roads, sewerage networks and sanitation. Second, the community was put in charge of managing the funds for the upgrading through the Ga Mashie Development Committee. This democratically elected body manages a fund through which community groups apply for grants to implement projects in the settlements and has set up a micro-finance guarantee facility with a local bank for affordable business loans to benefit youth and women. Thirdly, an important component of its community participation is the training and capacity building of its residents. Through training and hiring, local residents are employed and gain the skills to become craftspeople. By 2019, the Ga Mashie Development Committee had more than 5,000 members and had improved public space, urban safety and flood risk for over 100,000 residents.

defined by the government and exclude proposals from citizens or nongovernmental actors, so that participation becomes tokenistic and does not meaningfully influence the decision-making process.[133]

Participatory planning can invite Not In My Back Yard (NIMBY) rhetoric. For example, new affordable housing developments in the United States are often challenged and impeded through participatory processes whereby existing residents register their objections to new construction.[134] A key challenge for the future of urban governance is how to balance genuine residents' concerns to protect their quality of life with necessary transformations in transportation and housing while taking into account historical socioeconomic inequalities.

These concerns highlight the need for a combination of participatory processes between those that are instituted by government and those that are catalysed by residents. Urban governance for the future of cities will need to be more communicative, transparent and participatory in order to rebuild a social contract between the state and the public that is strong enough to withstand multiple and complex challenges in the future. A promising example that has withstood the test of time and continues to evolve is participatory budgeting. By providing residents with an opportunity to peer into city budgets and deliberate over how to allocate funds, cities build social capital and public buy-in on the most basic of government functions: raising and spending revenue. Participatory budgeting originated from Brazil, but has since sparked countless iterations globally, both in the developed and developing world. For example, Boston youth have allocated $1 million of public funds annually since 2014 for capital projects on city property.[135] More recently, the city of Seattle earmarked

Interchange in Ghana © Shutterstock

$30 million for a participatory budgeting exercise focused on dismantling systemic racism through investments in housing, education and healthcare in minority communities that will begin in 2022.[136] Both the Republic of Korea and China have mandated participatory budgeting, though there continues to be variability in specific applications of this tool.

As highlighted in Chapter 3, slum upgrading in partnership with informal settlement communities helps to harness their skills and lived experiences. Similarly, effective participatory upgrading is hard to achieve in isolation and is enabled by other transformations of urban governance. The participatory upgrading of Mukuru in Nairobi (see also chapter 7) provides a clear example of the enabling role of decentralization and legal frameworks. Mukuru's participatory upgrading was enabled by decentralization introduced much prior under the 1998 Local Authorities and Transfer Fund, which redistributed 5 per cent of national tax revenues to local authorities.[137] The 2015 Nairobi City County Public Participation Act and the 2016 Community and Neighbourhood Associations Engagement Act provides a clear legal framework that shifted the top-down nature of earlier participatory processes, which were initially dominated by local chiefs and leaders, to a more inclusive form of participation.[138]

The New Urban Agenda highlights that participatory processes should recognize the specific needs of those in vulnerable situations. Local governments are strategically positioned to facilitate the role of intermediaries or access points and act as a conduit for the marginalized and disadvantaged groups within urban settings to meaningfully participate in the decision-making that impacts their lives.[139] In some situations, the most effective role for local government is to create a space for collaboration around a locally identified need and then allow for other local actors to take the lead. However, this is not a call for the privatization of services which dramatically undermine cities' inclusiveness and sustainability.[140] In Langrug, an informal settlement in Stellenbosch, South Africa, a citywide urban poor platform and finance mechanism was created to fund projects identified and prioritized by residents. Each block within Langrug oversaw project implementation like the installation of flush toilets or the creation of play areas.[141] In contexts where participation is not meaningful or invited, civil society organizations have an opportunity to demonstrate and agitate for forms of participatory, deliberative and direct democracy.[142]

8.2.6. Financing for sustainable and resilient futures

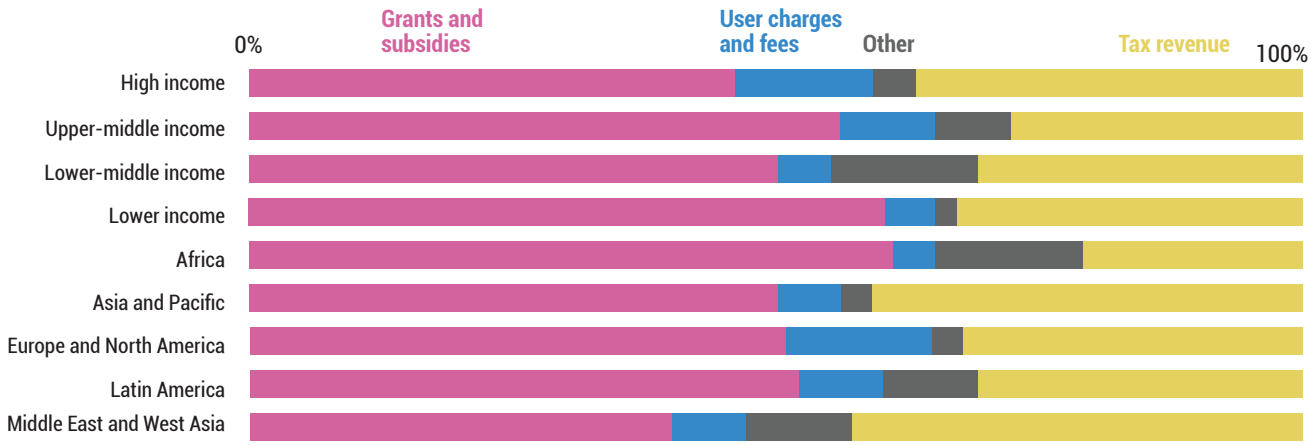
The scale and ambition of the SDGs and the New Urban Agenda require new thinking on how urban development is financed, as addressed in chapter 4, which covers the diversification of municipal finance in detail. Insufficient budgets and fiscal uncertainty are among the biggest urban governance challenges cited globally.[143] An appropriate combination of endogenous financing and intergovernmental fiscal arrangements are prerequisites for and indicators of effective urban governance.[144] The bare minimum for effective urban governance is that available budgets meet the scope of responsibilities assigned to local governments through decentralization, but ideally would also include revenue for investment in development and growth. The COVID-19 pandemic has highlighted that limited autonomy lowers local government's ability to respond quickly in the best interest of urban residents. After suffering from pandemic-induced economic contraction, Johannesburg, South Africa, provides a promising example as the national government's relaxation of spending restrictions allowed local decision-makers to reallocate some budget items to meet emergent and urgent needs.[145]

The key message in financing for sustainable urban governance is that the revenue local governments can raise through taxes will always be insufficient to keep up with the required infrastructure and service delivery needs. The municipal financing gap in Africa alone is estimated at US$25 billion per year.[146] Prior to the pandemic, it was estimated that LIDCs need to increase their spending by roughly 12 per cent of GDP to achieve the SDG's. The economic setbacks caused by the pandemic now put that number at roughly 14 per cent of GDP.[147]

The revenue sources for local governments generally fall into three broad categories: grants and subsidies, tax revenue, and user charges and fees. On average, tax revenue represents 32.7 per cent of local government funding (Figure 8.4). In OECD countries, fiscal decentralization over the last few decades has given subnational governments greater economic importance.[148] However, in some countries, such as Uganda, Kenya and Tanzania, tax revenue accounts for less than 5 per cent of subnational revenue.[149] As discussed in Chapter 8 of the World Cities Report 2020, property taxes have significant potential as they are under-utilized in many cities, primarily in low- and middle-income countries (Figure 8.4), in part because of limited human resources as well as out-of-date property registers and cadastral maps.

National governance frameworks often limit local governments in their ability to expand local revenues. According to a 2016 database, 36 per cent of city governments could not change or introduce new local taxes, and only 15 per cent of cities had the mandate to both introduce and change local taxes, with the remainder dependent on higher levels of government.[150] When local taxes are subsumed by the national government, such as in China, local governments often seek their own revenue

Figure 8.4: Share of revenue for subnational governments



Data sourced from OECD and UCLG, 2019.

through speculative land development to fill the gap.[151] This type of incentive should be avoided and local governments should instead focus on tax collection efficiency, as well as promote transparency, accountability, participation and performance-based incentives to build autonomy.[152]

To supplement revenues, governments must lean into financing from the private sector, debt financing and pooled borrowing.[153] Most of these mechanisms require subnational governments to achieve creditworthiness and national governments to relax rules regarding local government borrowing. Less than 20 per cent of the 500 largest cities in developing countries are deemed creditworthy and less than 20 per cent of all cities in developing countries can issue bonds to local investors.[154] Even when cities do have their financial house in order, they can face obstacles from national government for political reasons. For example, the Ministry of Economy and Finance of Senegal blocked the city of Dakar from issuing its first-ever municipal bond in 2015. This move came despite a local public expenditure and financial accountability review, and after Dakar had improved its credit rating and secured a 50 per cent partial risk guarantee.[155]

From a 2016 survey of 127 cities (self-reporting), 87 per cent of cities had borrowed money over the last 10 years, yet only 21 per cent of these cities could borrow without legal limit set by their national government.[156] Green bonds have gained traction to finance climate action, more than quadrupling between 2016 and 2021.[157] In 2013, Johannesburg became the first city in the C40 Cities Climate Leadership Group to issue a green bond. However, green bonds are primarily issued by national governments and cities in development countries are responsible for only 2 per cent of all green bonds issued since 2007.[158]

The consequences of a national government assessing the risk and cancelling access to municipal debt markets highlights the need for clearer and more effective regulatory frameworks.[159] The risks associated with borrowing can partially be alleviated by developing funding sources and policies in parallel to developing a vision for intervention and investment.[160] Multilevel governance can also lower risks, as the involvement of multiple orders of government and alignment with a national urban policy provides national governments confidence to relax rules around borrowing at the local level. In fact, smaller and secondary cities may need to pool their credit requirements or enhance their credit quality through bond banks, loan pools and guarantees to reduce risk and attract lenders.[161] A simple, innovative example has emerged out of Colombia in their public ratings of municipalities' subnational debt.[162] Borrowing is prohibited for so-called "red-light municipalities" whose ratio of interest to operational savings exceeds 40 per cent and whose ratio of debt stock to current revenues exceeds 80 per cent. "Green-light municipalities" can borrow uninhibited and "yellow-light municipalities" can borrow with approval from the central government.

Local government finances are supplemented with grants and subsidies from higher levels of government, international organizations (e.g. European Union) and international aid, which combined represent on average 51 per cent of their income (Figure 8.4).[163] However, only 1.3 per cent of total bilateral development assistance is provided to cities and regions. [164]

In light of this low figure, new city-to-city networks are pioneering decentralized development cooperation as an innovative form of participatory cooperation that bypasses central governments.[165] With an estimated 70 per cent of cities across donor and developing countries engaged in peer-to-peer exchanges, including cross-border partnerships, the enabling environment for decentralized development cooperation is growing.[166] While the liminal nature of decentralized development cooperation can lower accountability and potentially exacerbate inequality, there are innovative approaches that deserve pursuit. For example, the European Committee of Regions organized a so-called "decentralized stock exchange" that pools members' expertise and promotes access to subnational financing in developing countries through financing instruments that reduce the risk of investment.[167]

Despite their poor record of delivery, privatization and public-private-partnerships are still widely promoted as solutions for cash-strapped local governments in low-, middle- and high-income countries.[168] In middle- and high- income countries, privatization has increased alongside austerity policies. In low-income countries, privatization is promoted under the guise of development aid, forcing governments to engage in complex and costly PPPs instead of building effective public services.[169] One response to these concerns is the shift towards public-private-people partnerships (4P), which institutionalize the involvement of people into development projects. The World Urban Forum 9 report suggests that international institutions should promote public ownership, public banks and in-house government management of essential urban public services rather than public-private partnerships, private sector financing, city benchmarking and philanthropy.[170]

A Road under construction in Nairobi, Kenya. © NoyanYalcin/Shutterstock

8.3. Emerging Urban Governance Responses to Five Pervasive Challenges

The pace and scale of global urbanization continues to outpace the ability of governments to plan and provide services for all, especially in low- and middle- income countries. Current modes of urbanization are stretching the boundaries of cities, blurring jurisdictional lines and leading to a lack of clarity about who handles emerging challenges. UN-Habitat identified four major shocks facing cities globally, namely climate change, extreme poverty and inequality, the fourth industrial revolution and COVID-19. In order to steer cities towards the optimistic scenario outlined in Chapter 1, the necessary urban governance responses to these shocks must also acknowledge the reality of unplanned growth and the blending of urban, peri-urban and rural areas.[171] While the human impact of each of these shocks, individually and collectively, are discussed in other chapters, they provide a framework to explore emerging urban governance strategies to ensure local government is prepared to address them.

8.3.1. Blurring lines of urban jurisdictions and boundaries

Urban extension has surpassed urban population growth globally and, due to that expansion, many cities have grown beyond the boundaries of their central municipality.[172] Neighbouring municipalities have agglomerated into contiguous urban regions and peri-urban and rural hinterlands have become more connected. Chapter 2 highlighted the rise of these urban areas, while Chapter 6 discussed sprawl as a driving factor for this spatial extension. Bridging geographic scales is increasingly difficult when the administrative boundaries do not match the functional integration of metropolitan regions.[173] In Africa, the ability of local governments to control urban sprawl is often limited by lands being under the customary ownership and authority of traditional leaders.[174] Informal settlements on the edge of urban jurisdictions are vulnerable to eviction due to unclear regulatory frameworks, as was demonstrated by a recent large-scale eviction in India.[175] Sustainable urban governance can only be achieved when effective regional planning systems are institutionalized, such as through metropolitan governance or through national urban policies.

The global metropolitan phenomena that impact cities of any size and territorial characteristics force us to revisit and adapt urban governance and management frameworks. New approaches based on cooperation, solidarity and collective action between local and neighbouring governments are essential to cope with the most pressing challenges of sustainable development, namely pandemics and other health crises, climate change, the risk of armed conflict, extreme poverty, socioeconomic inequalities and rapid technological advancement, among others. To be sure, these challenges do not recognize political nor jurisdictional boundaries. Cities with integrated metropolitan governance and management systems are better prepared to plan for, prevent and respond to urban challenges. COVID-19 reinforced metropolitan governance as a necessary approach for advancing balanced and sustainable urban and territorial development.[176] The territorialization of the COVID-19 response through regional planning and the use of small and secondary cities as subregional health responses to reach out to rural communities served as a key mechanism to respond to the pandemic.

One approach to improving clarity within multilevel governance for urban development is the development and implementation of a national urban policy (NUP). The World Cities Report 2020 showed that NUP's gained prominence as important guiding instruments to promote coherent and consistent urbanization within a country's boundaries. Both the 2030 Agenda and the New Urban Agenda advocate for the importance of NUPs. While NUPs are an important first step, the 2022 Quadrennial Report on the Implementation of the New Urban Agenda observed that an uptick in adoption of NUPs has not yet translated to impact on the ground. In much of Africa urban plans are being used to attract the private sector both locally and internationally to invest in sustainability projects that unfortunately do not substantially improve public infrastructure.[177] This mismatch indicates that policy coherence through a NUP is a necessary but insufficient condition for effective multilevel governance.

There are however also promising examples. The 2015 National Urbanization Policy of Rwanda exemplifies country-level response. That NUP is further echoed in the Urbanization and Rural Settlement Sector Strategic Plan 2018-2024, which promotes better management of urban sprawl into peri-urban and rural areas.[178] The plan aims to achieve that goal through improvements to transport services that connect urban and rural areas and by enhancing the opportunities presented by the increasing demand for horticultural and livestock products while mitigating the resource depletion and other environmental impacts at the edge of urban sprawl.[179] Additionally, Rwanda has a national roadmap for green secondary cities that was developed and aligned with the aforementioned plans.[180]

8.3.2. Pandemic and health crisis response

The current COVID-19 pandemic is not the first, nor will it be the last, major crisis that will challenge urban governance systems. Chapter 1 discusses the rise of zoonotic diseases as new layers of health risks that the world is increasingly experiencing and will be an ongoing feature of urban governance.

A threat anywhere is a threat everywhere and no one is safe until everyone is safe.[181] Indeed, the World Health Organization highlights both the moral imperative and the practical considerations in ensuring equitable urban governance towards managing current and future pandemics and health crises.[182]

Health equity, as highlighted in chapter 7, is an urban governance challenge that requires a multilevel approach with better collaboration between government departments and non-state actors supporting monitoring and evaluation in expenditures and service delivery. A scoping survey by the Emergency Governance Initiative, which included 57 cities in 35 countries, revealed that difficulty of working across different tiers of government was the most pressing challenge in dealing with the pandemic (Figure 8.5).[183] Politicized response to the pandemic in Brazil and the United States, led to low levels of national coordination between state level responses.[184] While lockdowns were often initiated by national or state governments, it was ultimately up to local governments to enforce them.

The pervasive presence of public health emergencies globally indicates the need for accountability and transparency in public health governance to ensure health equity. However, based on recent representative research, it is estimated that around 800 million people pay bribes to health services every year.[185] Corruption in the health sector is estimated to kill approximately 140,000 children annually and impedes the global fight against diseases like HIV/AIDS.[186] A recent publication estimates that US$500 billion in public health spending is lost globally to corruption every year, enough to achieve universal health coverage.[187]

Evidence has shown that cities with a more equitable and accessible distribution of basic services were better able to protect vulnerable and high-risk communities from the beginning. Equitable and well-planned cities that address spatial inequalities and provide equitable access to basic services and infrastructure are more resilient to the shocks caused by pandemics.[188] Research has noted that cities with

Children wash their hands at a facility put up in Kibera slum, Nairobi, Kenya@UN-Habitat/Kirsten Milhahn

more autonomy in local government are better positioned to respond to health care crisis with contextualized knowledge and experiment with different approaches and service delivery.[189] For example, Guangzhou, China, hired nearly 80,000 residents to conduct community patrols for containment measures and countries like Germany and Republic of Korea allowed local governments to undertake healthcare implementation.[190]

National urban policies are an urban governance tool that supports balanced and coherent urban development. They help bridge policy silos and can be leveraged to anticipate and respond to the implications of COVID-19 and future public health related shocks.[191] They are especially important for secondary cities and their access to national level supports and territorial cooperation in the face of public health challenges. For example, one key to the National Urban Development Policy 2018-30 of Costa Rica is the articulation of a network of intermediate cities to allow sharing and capitalize on best practices, learning and financing opportunities.[192]

Government interventions in the interest of public health can cause economic and social costs as well as impact urban residents' routines, mental health and social security. While curfews, lockdowns and restricting where people gather have proven effective at limiting the spread of COVID-19, less costly and more trust-based approaches have only been marginally less effective. These include risk communication strategies, promoting social distancing and workplace safety measures, encouraging self-isolation when symptomatic, and travel warnings. Inclusive urban governance needs to assess the risks and costs for all urban residents of responses to health crises.

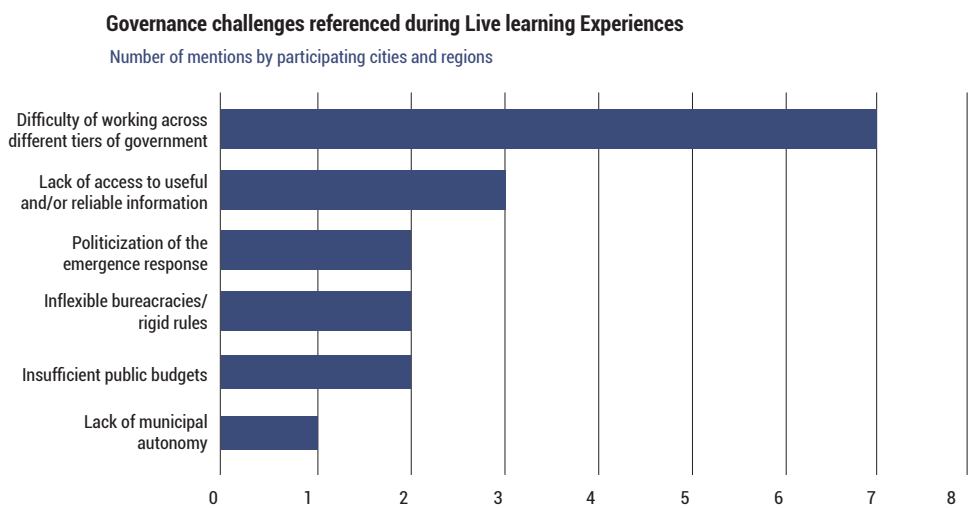
8.3.3. Climate change

As discussed in Chapter 5, greenhouse gas emissions continue to rise globally, of which cities are responsible for over 70 per cent. While addressing global emissions will require national and supranational actions, cities are central to adaptation and mitigation efforts. The optimal level of decentralization of climate policy is context-specific with local governments facing restrictions to environmental taxes and weak capacity to deliver on climate mandates.[193] The Coalition for Urban Transitions suggests that by 2050 local governments can reduce urban emissions by one-third through their own actions and another one-third through collaboration with national governments.[194] In developing countries, climate policy is not a well understood area of practice to many local governments and as a result, very few stakeholders understand the importance of considering climate change in city planning.[195] Further, the time horizons are not aligned with government timeframes and electoral cycles provide political cover for inaction.

Chapter 5 also discusses climate-related extreme disasters, which have increased significantly in recent years,[196] while the number of globally displaced people rose above 65 million in 2017, almost twice the level from 20 years

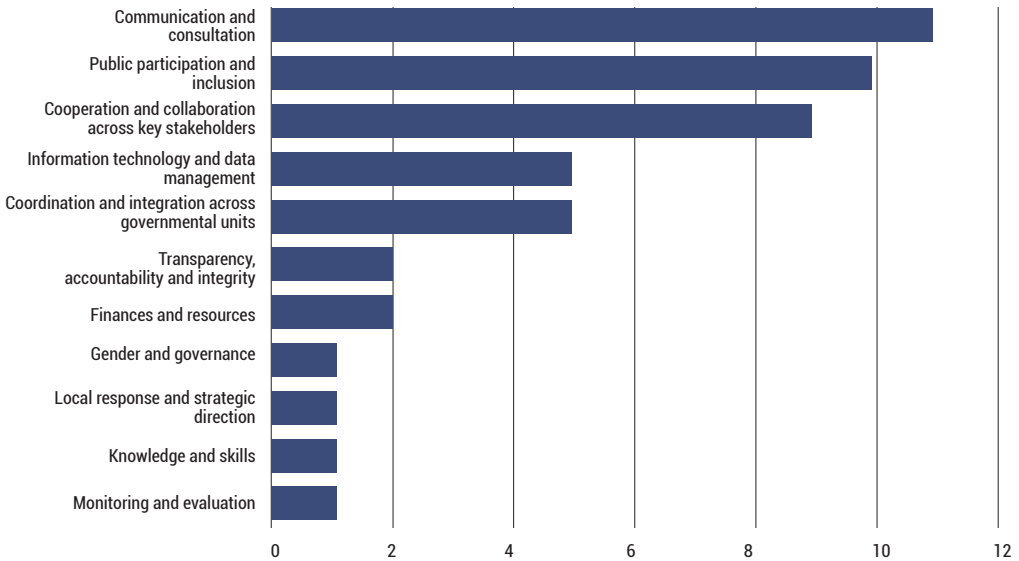
Research has noted that cities with more autonomy in local government are better positioned to respond to health care crisis

Figure 8.5: Governance challenges and innovations during the COVID-19 pandemic



Emergency governance innovations referenced during Live Learning Experiences

Number of mentions by participating cities and regions



Source: Emergency Governance Initiative, 2020.

ago,[197] which poses severe governance challenges. The Mayors Migration Council (MMC), a mayor-led advisory and advocacy organization on migration and displacement, has called for a range of actions in the realm of urban resilience, urban inclusion and urban transformation to address climate-change induced migration, such as the need to "modify national legislation to allow the integration of informal workers – including migrants and displaced people – into green development plans."[198]

A further urban governance challenge is to (re)invent public services for the future of cities to address the challenges of meeting basic needs while adapting and mitigating climate change impacts. Co-production and re-municipalization are two governance tools to ensure that energy, water, waste and transport are simultaneously meeting the needs of the most vulnerable residents and reducing the environmental footprint of cities. In contrast to the ever-increasing prices and environmental impacts of corporate operations in the energy sector, new local public companies and co-operatives, like Hamburg Energie (Hamburg, Germany) and Kauai Island Utility Cooperative (Kauai, US) have been developing renewable energy sources in a way that lowers cost and improves service to all residents.[199]

A further urban governance challenge is to (re) invent public services for the future of cities

Climate and environmental challenges require co-ordination beyond local, regional and national territorial scales and into supranational policy frameworks.[200] A recent survey on national urban policies found unique supranational policy frameworks in distinct contexts that respond to local needs. For example, Luxembourg is engaged in a cross-border co-operation policy with France in response to the joint needs of the Alzette Belval conurbation.[201] The Netherlands has had country-to-country agreements for many years focused on river management and urbanized delta areas.[202] In these emerging supranational agreements, national urban policies play an important role in providing a basis to guide the priorities of the international policymaking process.[203] A risk-based decision-making model favouring integration and long-term planning with appropriate local, community, national and supranational governance structures is essential for mitigating and adapting to climate change.

8.3.4. Extreme poverty and inequality

As highlighted in Chapter 3, extreme poverty and inequality remain pervasive urban challenges. With outdated territorial demarcations due to unplanned urban expansion, public interests are poorly represented and the urban poor are often geographically, economically and socially excluded and most vulnerable to challenges.[204] In many parts of the world, urban governance arrangements are attuned to middle classes, while the urban poor are left behind. Land that is illegally occupied by affluent residents may be tolerated, while the urban poor are evicted from slums that have been formally

Land that is illegally occupied by affluent residents may be tolerated, while the urban poor are evicted from slums that have been formally registered for decades

registered for decades. The term "aesthetic governmentality" refers to urban governance that manipulates the law based on standards of appearance and nuisance, rather than the rights of the urban poor.[205]

It is pertinent for governments to fully acknowledge and invest in slum dwellers and their organizations as true development partners. For example, Shack/Slum Dwellers International and the Asian Coalition for Housing Rights alone have over 800,000 members and operate across 698 cities in 48 countries.[206] The Poverty Reduction Fund of Lao PDR recognized the importance of collaboration with slum dwellers and invested in community-led initiatives that resulted in nearly 900,000 slum dwellers with increased access to basic services.[207]

Non-governmental institutions including formal organizations and loose mutual aid associations have also created innovative forms of governance while both collaborating with and operating outside of formal government.[208] Micro-finance and community savings groups play a role in closing the gaps caused by insufficient public and private investment. Many mutual aid networks stepped in during the pandemic to coordinate and distribute critical resources that address government and market failures. For example, in Thailand, over 1,400 food pantries emerged providing a place for people to donate food and supplies to those in need.[209] Others are collaborating with the public authorities, like Mask Map in Taiwan, which is driven by government-provided mask and pharmacy data to provide real-time information on mask availability. This information by public authorities is taken by a civic hacking organization and coordinated, maintained and published for public consumption.[210]

8.3.5. Ubiquitous data and frontier technology

While access to, and the availability of, frontier technologies are uneven in cities around the world, this is undoubtedly a global issue for urban governance to address in the pursuit of sustainable and inclusive cities. Technologies create exciting possibilities to enhance the well-being of residents, improve environmental management and contribute to economic development. The positive and negative disruptive consequences of social media and other big tech platforms, artificial intelligence, the internet of things, big data and blockchain will play out in urban areas and influence city management and service delivery.

It is pertinent for governments to fully acknowledge and invest in slum dwellers and their organizations as true development partners

Governments, especially in low- and middle-income country contexts, cannot be passive recipients of technological innovation. National leaders recognize that intersectoral city planning requires good statistical and geospatial data, which is not currently accessible to local governments. The normative advantages to technology too often lead to technological solutionism, or finding a problem for an externally devised solution.[211] Technological solutionism is also connected to the fantasy of the smart city as a magical solution to all urban problems, which ends up making the governance of core urban problems even more opaque.[212] Given that regulating technology is often outside of the jurisdiction of local governments, this challenge reiterates the need for multilevel governance.

In addition to governing through the use of technologies as discussed in Chapter 9, the potential abuse of technology will create challenges. Globally there are already examples of exploitation of big data and usage beyond its original and agreed upon scope, increasing privacy and security concerns.[213] The absence of public oversight and accountability on the extensive data records of individuals and communities raises concerns around privacy,

Adoption of renewable energy in cities is a means of lowering urban emissions and the effect on climate. © artjazz/Shutterstock

surveillance, data sovereignty and individual autonomy. Human rights obligations apply online as they do offline. Using principles like those found in the Open Smart Cities Guide, the result of a year long collaborative research project in Canada, ensures that emerging technologies are governed in a way that is ethical, collaborative, accountable and transparent regardless of the urban stakeholders that own the initiative.[214] The OECD highlights the need for re-regulation over deregulation in the era of emerging technologies.[215]

8.4. Divergent Urban Governance Futures

Long-term prospects as outlined in Chapter 2 point to a world that will continue to urbanize, with urban areas expected to absorb virtually all future population growth globally. A recent report defines transformative change in urban governance as "lasting change that enhances access to urban services and opportunities while improving institutional practices and outcomes across multiple urban sectors and enduring across political administrations."[216] These scenarios introduce potential urban futures based on current urban governance trends that have the potential for increasing resilience and sustainability in line with the optimistic scenario of Chapter 1 or causing dire consequences that would lead to the high damage scenario of Chapter 1.

8.4.1. The potentials and pitfalls of technologically-mediated future cities

Smart city technology promises to generate economic, social and environmental value through a connection of urban services and infrastructure by emerging and existing technologies. While the possibility of realizing this value exists, there is limited evidence that smart technologies are enhancing social well-being, building just and equitable communities and reducing environmental degradation.[217] Technology in and of itself is neutral, but its development and application is full of human bias. For example, facial recognition algorithms have been demonstrated to have racial bias that is already causing problems in its application.[218] Chapter 9 highlights an important distinction for the governance of smart cities, namely the development of new infrastructure versus the improvement of existing infrastructure. This debate is the macro-level expression of the linear production model ("take-make-dispose") versus a closed production cycle emphasizing repair, recover, reuse and recycle.[219] Already, there is a global annual deficit of infrastructure investment worth US$3.3 trillion.[220]

An emerging question is how does "smart" technology investment contribute to sustainable development rather than take away from it? Creating completely new "smart cities" instead of investing in the upgrading of infrastructure in existing cities drains the capacity of local government and competes with resources from the rest of the city.[221] For example, Konza Techno City outside of Nairobi and Hope City in the Greater Accra Region take away from investment in existing urban areas.[222] Critically, smart cities are often developed through the parallel governance of newly established corporations and often lack accountability to the public the way an elected government is.[223] So, what does the future of technology in urban governance look like in the future? Are technology and democracy locked in conflict? There are two predominant scenarios for the future application of technology in urban governance.

First, private-sector led growth that prioritizes new technology leads to increased investment directed away from core services and increased risk of privacy consequences. Chapter 6 of the World Cities Report 2020 indicated that the global demand for smart cities was growing rapidly, reaching US$1 trillion in 2019 and an estimated US$3.48 trillion by 2026. There is also the tendency for the design of online services and infrastructure to be guided by the technologies available rather than resident needs.[224] The deification of technology occupies mainstream policy and has resulted in a close union between governments and private technology companies that are driven by entrepreneurialism and profit-seeking public-private partnerships.[225] As discussed in Section 8.3.5, combatting this tendency will require a combination of new regulations and adapting existing regulations to ensure that corporate players do not have inappropriate access to data and unfair advantages in the competition to supply the public sector with technology. [226]

The second and more preferable scenario is that of smart, sustainable cities that facilitate healthier and more inclusive cities. The application of ICT in cities requires care to avoid empowering corporate interests and further exclude those already marginalized by prevailing technocratic and entrepreneurial approaches to urban governance.[227] Technology development and use that is fit for purpose, inclusive, transparent and accountable can lead to sustainable and resilient urban futures, but it is a process that will take time and it will not be as flashy as corporate-led investments. For example, a more inclusive approach to smart city governance may lie in the development of "digital twins" of existing cities, or virtual models that allow for real-time urban management.[228]

8.4.2. Can decentralization survive global pandemics and climate change?

Centralization or decentralization, which one has proven to be more effective during the COVID-19 pandemic and what approach will countries take to build sustainability and resilience against future shocks? Two divergent scenarios may unfold: one with accelerated decentralization to city-led urban governance and one of recentralization to national or centralized metropolitan governments.

Decentralization has long been upheld as a trend that enhances democracy as well as ushers in greater accountability, proximity and civic participation. A decentralized approach means there is no single point of failure as is the case in centralized governance.[229] This holds true from a public health and an economic perspective as local governments are well-positioned to support entrepreneurs and business in mitigating the economic consequences of global shocks.[230] In their manifesto, Fearless Cities, the Global Municipalist Movement argues that decentralization has not gone far enough.[231] In re-establishing closer connections between residents and governments, decentralizing governance to the city level may not be enough, as some large metropolitan governments, such as Chongqing, China, and Tokyo, Japan, have populations larger than most countries. The United Nations University suggests that beyond public health, decentralization is imperative for migrants as the negative impact on global GDP will cause more people to move in search of safety and opportunity.[232] Research demonstrates that the overall effectiveness of local government has a direct impact on anti-immigrant sentiment and well-managed services contribute to positive intergroup relations.[233]

While decentralization has been described as a "revolution" in governance and a priority for global institutions and literature for the past three decades, the results have been unequal. A pervasive argument against decentralization is that some of the worst examples of corruption are found at the local level where politicians and administrators enjoy minimal oversight.[234] Oversight by higher levels or different spheres of government can provide accountability in the planning process, but the line between oversight and corrupt interference is slippery.[235] The technical staff within a government responsible for planning and the daily management of services risk being ousted by local political elites when their interests do not align.

The impact of decentralization to enhance economic growth has been questioned since the early 2000s.[236] Later, the 2008 global financial crisis tested countries' commitment to decentralization with some explicit recentralization reforms, primarily as a result of austerity policies.[237] Hungary is a frequently used example in its recentralization efforts between 2011 and 2012, with the central government rewriting the Local Government Act and retaking control of many functions previously exercised by subnational governments.[238] While recentralization is largely considered a regression for urban governance, there are suggestions that the enhanced control of national government has boosted bargaining power of subnational jurisdictions as well as increased their ability to influence national policymaking.

8.4.3 Addressing the trust equation

Crises test people's trust in their governments and institutions, especially as they persist without a clear end in sight causing social and economic impacts to deepen and individual freedoms are restricted. Indeed, the COVID-19 pandemic has demonstrated that trust in urban governance institutions is crucial for the success of the responses against impending threats. This section poses two divergent scenarios: one of a future with trust in public institutions and one with a continued erosion of that trust.

Political stability and attempts to mitigate crisis are undermined when residents encounter corruption and lose faith in their government's ability to provide basic services.[239] Even prior to the current pandemic, there was a lack of trust globally in most urban governance institutions, including business leaders, civil society organizations and the media.[240] Violations of land and housing rights put a major strain on building trust. Despite calls by the international community to halt displacements,[241] evictions continued throughout the COVID-19 pandemic. The Housing and Land Rights Network documented the forced eviction of close to 10 million people between January and October 2020 alone.[242] As long as such practices continue, trust between residents and government will not be regained. Citizens that live further out in the urban-rural periphery tend to trust their governments more and are more likely to evaluate both local and national officials positively.[243] When trust in municipal urban governance is lost, residents can turn to parallel forms of governance (section 8.2.2).[244]

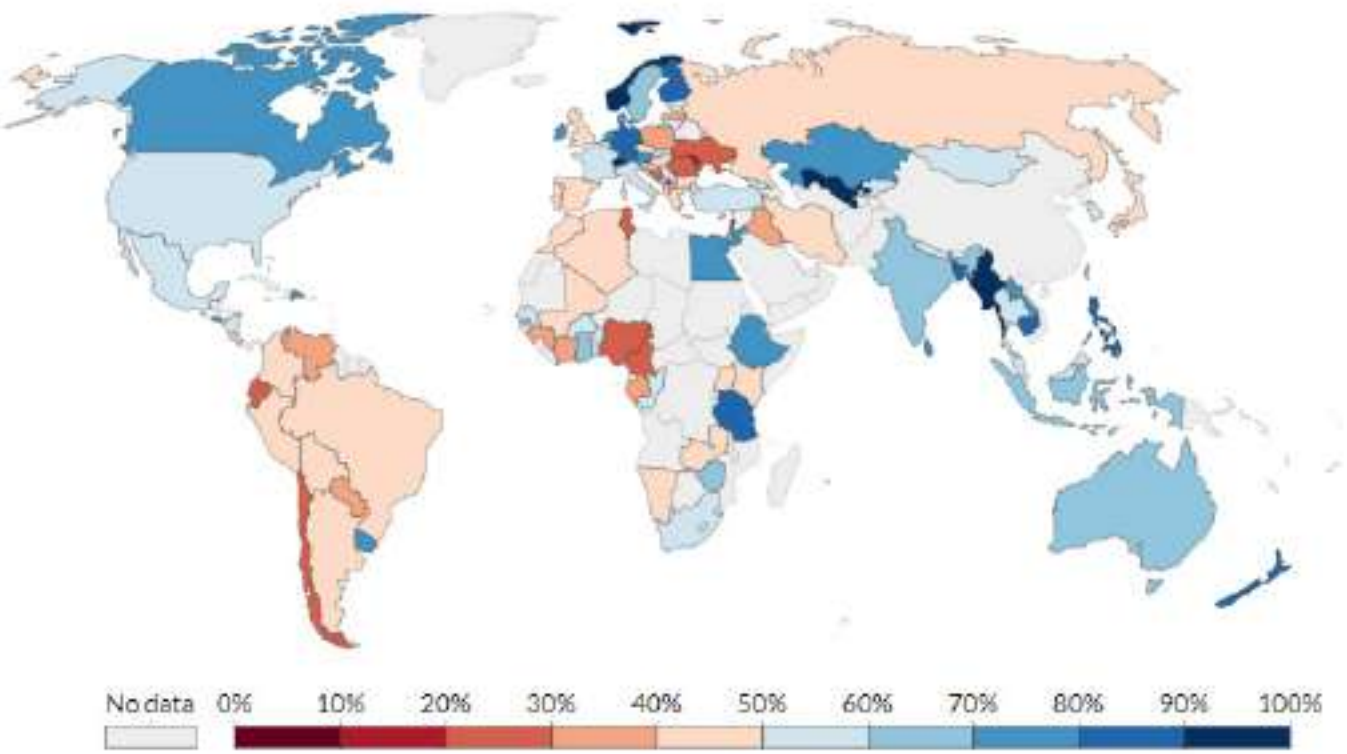
Despite calls by the international community to halt displacements, evictions continued throughout the COVID-19 pandemic

Evidence of corruption or a mishandling in the interest of a select few can undermine the ability to effectively respond to crisis situations and deepens the social and economic impact.[245] Further, even the perception of corruption has a negative impact on trust in, or the perceived legitimacy of, governance institutions.[246] A survey indicated that over 60 per cent of responding city governments in Africa and Latin America and the Caribbean, considered "lack of trust in local government" and "risks of corruption" relevant to highly relevant as an urban governance challenge[247]. According to a recent study, nearly half of South African and almost three-quarters of Zambian urban planners surveyed are faced with pressure to ignore or violate planning rules, policies or procedures.[248]

According to Wellcome Global Monitor 2020, trust in public institutions is highly variable around the world and does not neatly align to income categories (Figure 8.6).[249] Improving trust is not dependent on increased economic performance and trustworthy institutions can be built regardless of the countries income level. A recent survey of local governments across 35 countries on all continents indicated that many governments have been focusing on finding new ways to assure residents that they can be relied upon in times of crisis.[250] One recent pathway for governments to rebuild trust is the Open Government Partnership Local initiative,[251] which assists governments in their efforts to turn to open government principles, expand and facilitate access to public information, increase transparency and accountability of decision-makers and introduce co-creation into public policies with the ultimate goal of creating or rebuilding trust in the public sector. [252]

Building trust also means building capacity of local planning offices. When there are few qualified planners and public pay is low and irregular, there is increased risk of planners working on private commissions alongside their public responsibility.[253] The integration of mechanisms to ensure transparency and the protection of the common good are important within situations of crisis to ensure that emergency measures are accountable and proportional. Other means for building trust are reflected in the Open Contracting

Figure 8.6. Share of people who trust their national government



Source: Wellcome Trust, 2021.

Partnership[254] or to commitments made around data and information transparency like the Open Data Charter.[255]

8.5. Concluding Remarks and Lessons for Policy

The disruptive nature of COVID-19 is a stark reminder that urban governance needs to be prepared for a dynamic and unpredictable future. The fluid nature of the pandemic exposed existing resource and capacity deficits in cities alongside their vulnerability to public health and climate change shocks. The disproportionate impact that systemic disruptions have on people with multiple deprivations highlights the need for a spatial justice lens to be applied to future urban planning and service design to ensure that benefits and vulnerabilities are distributed proportionately across distinct geographies and income levels. Globally, urban governance must become better prepared to predict, prevent, detect, assess and effectively respond to public health and climate change shocks in a highly coordinated, yet localized manner. National urban policies and effective legal frameworks have demonstrated effectiveness in both aligning urban development priorities within member states, but also lending structure to international agreements to combat the challenges like climate change that do not respect jurisdictional authority. No single government or multilateral agency can address such threats alone.

There is evidence that systems and structures built in response to previous pandemics and weather-related disasters were effective in mitigating the impacts of COVID-19. Many of these systems and structures rely on data and digital technologies to increase the ability of governments to make real-time, evidence-based decisions. It is imperative that international support and national urban plans centre the creation, use and reuse of data and the creation of data governance frameworks so that urban governance organizations build their capacity across the data lifecycle.

The battle for sustainable development will be won or lost in cities. While urban governance is a multilevel, cross-sectoral and integrated project, a country's level of decentralization, especially fiscal autonomy, will affect local government's ability to effectively facilitate the required collaboration and cooperation. There is an emerging consensus in the benefit and necessity of public-public cooperation whereby decision-making for urban development is stewarded by the level of government and their networks closest to the people. In some cases, that means the development priorities are community-led and community financed with a hands-off approach by government. Globally, cities are learning from, and in some cases being funded by, international networks and cooperation. These networks, in addition to providing knowledge exchange opportunities, are also providing smaller cities with a platform to have their perspectives heard and advocated for.

Collaboration across levels of government, private sector, civil society, academia and other stakeholders is surely to be part of the new norm and must be initiated to bridge the capacity constraints of each stakeholder group to respond individually to urban challenges. This type of collaboration will require recognition that values the strengths individual institutions bring to the collaboration. It will also require local governments to rethink the relationship between state actors and non-governmental actors, including residents. As global shocks and uncertainty arises, the need for legitimacy and trust in institutions is crucial. Rebuilding trust requires a commitment from all urban governance organizations to effective and open communication, meaningful participation opportunities that centre systemically excluded populations, and accountability structures built into integrated governance relationships. There is a need to both institutionalize resilience planning strategies and create space for urban governance models to adapt and be flexible in how they allocate resources.

Endnotes

1. UN-Habitat, 2020f
2. Avis, 2016.
3. See NUA paragraphs 11-13 of the New Urban Agenda for details of this vision.
4. United Nations, 2014.
5. UN-Habitat, 2020k.
6. WHO, 2021c, p. 13.
7. WHO, 2021c, p. iv.
8. Cities for Global Health, 2022.
9. UNESCO and UN-Habitat, 2009.
10. UNESCO and UN-Habitat, 2009.
11. Emergency Governance Initiative, 2020.
12. World Bank, 2021c.
13. World Bank, 2021c.
14. Open North, 2021.
15. UN-Habitat, 2021a.
16. World Bank, 2021c, p. 266.
17. Centraal Bureau van Statistiek, 2022.
18. OECD, 2019a.
19. United Nations, 2015.
20. OECD, UN-Habitat and UNOPS, 2021, p. 45.
21. OECD, 2020e.
22. Ha et al, 2021.
23. UN-Habitat, 2021a.
24. Puttkamer, 2020.
25. UN-Habitat, 2016a.
26. UN-Habitat, 2020a.
27. Chatwin, 2022.
28. World Economic Forum, 2020a.
29. NYC Mayors Office of the Chief Technology Officer, 2020, pp. i-ii.
30. Alliance for Affordable Internet, 2021.
31. Alliance for Affordable Internet, 2021.
32. Alliance for Affordable Internet, 2021.
33. Alliance for Affordable Internet, 2021.
34. UN-Habitat, 2021a, p. 76.
35. Open North, 2022.
36. OECD, 2018b, p. 131.
37. OECD, 2019d.
38. OECD and UCLG, 2019.
39. OECD and UCLG, 2019.
40. Emergency Governance Initiative, 2020.
41. UN-Habitat, 2021d, p. 14.
42. Cui, 2020.
43. UN-Habitat, 2020h.
44. UN-Habitat, 2021d, p. 14.
45. OECD and UCLG, 2019.
46. Ye, 2014.
47. Harrison and Gu, 2021.
48. OECD and UCLG, 2019.
49. GIZ and UN-Habitat, 2015
50. Ahrend et al, 2014.
51. UN-Habitat, 2021d.
52. Slack, 2019.
53. UN-Habitat, 2020k, p. 21.
54. OECD and UCLG, 2019, p. 38.
55. Avis, 2016.
56. LSE Cities, UN Habitat, and UCLG, 2016.
57. Mo Ibrahim Foundation, 2020.
58. Williams et al, 2011.
59. Swapan and Khan, 2021.
60. Biswas, 2009.
61. Swapan and Khan, 2021.
62. Ammann and Forster, 2018, p. 62.
63. Stacey and Lund, 2016.
64. Sundaresan, 2019.
65. Biggeri, 2021.
66. UCLG, 2021.
67. United Nations, 2020b.
68. UN-Habitat, 2018a.
69. Berggruen Institute, 2021.
70. Amiri 2021.
71. Kosovac et al, 2020; Acuto, 2016.
72. Boyce and Katz, 2021.
73. Acuto, 2016.
74. UNDRR, 2022.
75. Federation of Canadian Municipalities, 2022.
76. IISD, 1996.
77. UN-Habitat, 2016c.
78. City of New York and UN-Habitat, 2021, p. 13.
79. OECD, 2021b.
80. Bilsky et al, 2021.
81. City of New York and UN-Habitat, 2021, p. 23.
82. City of New York and UN-Habitat, 2021.
83. Emergency Governance Initiative, 2020.
84. Mitlin and Bartlett, 2018.
85. Wu and Zhang, 2021.
86. UN-Habitat, 2021d, p. 16.
87. Evans et al, 2021.
88. Williams et al, 2011.
89. Williams et al, 2019.
90. Anheier, Lang and Toepler, 2019.
91. Emergency Governance Initiative, 2020.
92. OECD, 2020e, p. 34.
93. UN-Habitat Youth, 2020.
94. Oliveira e Costa, Aaltonen and Rusanen, 2018.
95. City of Hamilton, 2019.
96. Manzini and Staszowksi, 2013.
97. Hillgren, 2013.
98. European Network of Living Labs, 2020.
99. De Ceuvel, 2022.
100. Steen and van Bueren, 2017.
101. Demuth et al, 2021.
102. Petitjean and Kishimoto, 2017, p. 159.
103. Kishimoto and Petitjean, 2017.
104. Beveridge et al, 2014.
105. Petitjean and Kishimoto, 2017.
106. Cities for Public Water, 2016.
107. Clifton et al, 2021; McDonald, 2018.
108. Barcelona En Comú, 2019.
109. Kishimoto and Petitjean, 2017.
110. McDonald, 2018, p. 52; Petitjean, 2017, p. 67.
111. McDonald, 2018, p. 48.
112. Petitjean and Kishimoto, 2017, p. 169.
113. Obeng-Odoom, 2016.
114. UN-Habitat, 2021d.
115. Hartmann and Thiery, 2022.
116. Freedom House, 2022.
117. Anheier et al, 2019.
118. Mo Ibrahim Foundation, 2020.
119. Mo Ibrahim Foundation, 2020.
120. CIVICUS, 2018.
121. UN-Habitat, 2022a.
122. Brinkerhoff et al, 2018.
123. CIVICUS, 2018, p. 30.
124. CIVICUS, 2018, p. 30.
125. Glass and Newig, 2019.
126. Shand, 2017, p. 2.
127. UN-Habitat, 2021h.
128. UN-Habitat, 2016a.
129. Mo Ibrahim Foundation, 2020.
130. Mo Ibrahim Foundation, 2020.
131. Blanco et al, 2020.
132. Meyer and Auriacombe, 2019.
133. Schlaufer, 2021.
134. McNee and Pojani, 2021.
135. Augsberger et al, 2016.
136. City of Seattle, 2021.
137. Rose and Omolo, 2013.
138. Horn et al, 2021.
139. Lee, 2013.
140. UN-Habitat, 2018d, p. 99.
141. Hambleton, 2015.
142. CIVICUS, 2018.
143. LSE Cities, UN-Habitat, United Cities and Local Governments, 2016.
144. OECD and UCLG, 2019.
145. UN-Habitat, 2021a.
146. OECD, 2019c, p. 5.
147. Sachs et al, 2021.
148. OECD, 2019d.
149. OECD and UCLG, 2019.
150. LSE Cities et al, 2016.
151. Wu and Zhang, 2021.
152. UNCDF, 2020.
153. Mutuku et al, 2019, p. 293.
154. International Bank for Reconstruction and Development and The World Bank, 2019.
155. Gorelick, 2018.
156. LSE Cities et al, 2016.
157. Climate Bonds Initiative, 2021.
158. Oliver, 2016, p. 3.
159. Martinez-Vazquez and Vulovic, 2017.
160. Gorelick, 2018.
161. Global Platform for Sustainable Cities and World Bank, 2018, p. 35.
162. Global Platform for Sustainable Cities and World Bank, 2018, p. 37.
163. OECD and UCLG, 2019, p. 73.
164. OECD, 2019b.
165. United Nations University, 2020.
166. UCLG, 2016, p. 23.
167. OECD, 2019b.
168. Petitjean and Kishimoto, 2017.
169. Petitjean and Kishimoto, 2017.
170. UN-Habitat, 2018d, p. 100.
171. UN-Habitat, 2021a.
172. UN-Habitat, 2016c.
173. Cruz et al, 2019.
174. Ammann and Forster, 2018, p. 65.
175. Rajagopal et al, 2021.
176. Forero and Sietchiping, 2022.
177. Obeng-Odoom, 2016.
178. OECD, UN-Habitat and UNOPS, 2021, p. 46.
179. OECD, UN-Habitat and UNOPS, 2021, p. 46.
180. OECD, UN-Habitat and UNOPS, 2021, p. 155.
181. Ghebreyesus and von der Leyen, 2020.
182. WHO, 2021c, p. v.
183. Emergency Governance Initiative, 2020.
184. Emergency Governance Initiative, 2021b.
185. Bruckner, 2019, p. 9.
186. Bruckner, 2019.
187. Bruckner, 2019, p1.
188. UN-Habitat, 2021a.
189. Wang and Rodríguez-Pose, 2021.
190. Collier et al, 2020; Wang and Rodriguez-Pose, 2021.
191. OECDb, 2021.
192. OECDb, 2021, p. 118.
193. World Bank, 2010, p. 335.
194. Coalition for Urban Transitions, 2019.
195. Lassa, 2019.
196. IPCC, 2018.
197. Benton et al, 2021.
198. Mayors Migration Council, 2021.
199. Demuth et al, 2021, p. 161.
200. OECD, UN-Habitat and UNOPS, 2021, p. 43.
201. OECD, UN-Habitat and UNOPS, 2021, p. 43.
202. OECD, UN-Habitat and UNOPS, 2021, p. 43.
203. OECD, UN-Habitat and UNOPS, 2021, p. 44.
204. Avis, 2016.
205. Ghertner, 2010.
206. Shand and Colenbrander, 2018.
207. Shand and Colenbrander, 2018.
208. McGuirk et al, 2020.
209. Emergency Governance Initiative, 2021b.
210. McGuirk et al, 2020.
211. Open North, 2022.
212. For further discussion, see section 8.4.1
213. UN Habitat, 2021a.
214. Open North, 2022.
215. OECD, 2020e.
216. Mahendra et al, 2021, p. 18.
217. Cavada et al, 2016.
218. Salem, 2021.
219. StartUs Insights, 2021.
220. McKinsey Global Institute, 2016.
221. Prasad et al, 2021.
222. Noorloos and Kloosterboer, 2018.
223. Prasad et al, 2021.
224. Gabrys, 2014.
225. Evans et al, 2019.
226. OECD, 2020f.
227. Hollands, 2015.
228. Deng et al, 2021.
229. Rossello and Dewitte, 2020.
230. Naude, 2020.
231. Barcelona En Comú, 2019.
232. United Nations University, 2020.
233. Ziller and Goodman, 2020.
234. CIVICUS, 2018.
235. Alexander et al, 2022.
236. Rodriguez-Pose and Bwire, 2004.
237. Allain-Dupre, 2017.
238. OECD, 2020e.
239. Stephenson, 2015;
240. CIVICUS, 2018.
241. United Nations High Commissioner for Human Rights, 2020.
242. Abdelkader et al, 2020.
243. Brinkerhoff et al, 2018.
244. Swapan and Khan, 2021.
245. IMF, 2021.
246. World Bank, 2010, p. 3.
247. LSE Cities et al, 2016.
248. Alexander et al, 2022.
249. Wellcome Trust, 2021.
250. Emergency Government Initiative, 2020.
251. Open Government Partnership, 2022.
252. Open Government Partnership, 2020.
253. Alexander et al, 2022.
254. Open Contracting Partnership, 2022.
255. Open Data Charter, 2022.

Chapter 9:

Innovation and Technology: Towards Knowledge-Based Urban Futures

Quick facts

1. Innovation and technology play an increasingly central role in planning for sustainable urban futures.

2. Digitalization and automation are rapidly transforming urban economies.

3. The urgency to decarbonize urban economies is driving the convergence of green and smart technologies.

4. The demand for smart city systems and solutions is estimated to increase annually by 25 per cent, with an overall market value of approximately US$517 billion.

5. Technological advances risk exacerbating existing, and generating new, socioeconomic inequalities.

Policy points

1. The deployment of innovation and technology should be tailored to suit the diversity of the urban context.

2. Cities need to consider the negative environmental externalities when investing in low-carbon, digital and connected technologies.

3. Urban economies need to be adequately prepared for the effects of advancing automation and digitalization.

4. To avoid top-down, one-way communication, the deployment of digital tools to address urban challenges needs to be inclusive, collaborative and empowering.

Since the World Cities Report 2020, two major areas of sociotechnical development have continued to accelerate and taken an even more prominent stage in planning for urban futures. The first area is the growing urgency for "unprecedented, aggressive decarbonization."[1] One proposed solution in the fight against global climate change is a series of green technological innovations that harness renewable energy sources, reduce energy consumption and protect other environmental assets. These innovations are key to creating sustainable cities and, as such, will not only significantly reshape urban infrastructure—buildings, transport systems, energy grids, etc.—but also exercise significant influence on urban daily life. The second technological development relates to unparalleled advancements in the digital world. Digitalization encompasses various smart technological innovations that enable ubiquitous computing, big data collection from widespread deployment of sensors and devices, large-scale data analytics, machine learning and autonomous decision-making. These connected and digital technologies find expression in the "smart city," which is now a major paradigm of urban policy and, increasingly, everyday reality. Each of these technological fields is significant on its own but, crucially, it is the confluence of the two that at present creates unique technological momentum with fundamental implications for the way in which future cities are governed and planned.

Cities are not mere bystanders in these technological transformations, but rather are both the setting for and protagonists in how these processes are played out. For one thing, it is predominantly in urban areas that environmental and smart technological innovations will be applied, with city governments and other urban actors expected to implement large-scale infrastructure renewals and building retrofit programmes. For another, the likely disruptive effects of technological innovation, such as rising precarious work and social inequalities, may be particularly pronounced in urban areas and, consequently, require careful assessment and context-specific intervention. Moreover, cities are not only implementors of new technology, but also drivers of innovation: they play an important role in facilitating collaborations among universities, start-up companies, technology firms, social enterpriss, and community groups. They even act as innovators themselves, for example as commissioners of utility services, building owners and land developers.

A key focus of this chapter, therefore, is on the opportunities and responsibilities that cities have in steering and managing these major socio-technical developments to prepare for urban futures. This stewardship requires as much attention to social, cultural and institutional factors as it does to technology itself.

Cities are not mere bystanders in these technological transformations, but rather are both the setting for and protagonists in how these processes are played out

Consequently, it also requires careful consideration of local conditions and contexts, since the impacts of technological innovations will be felt differently across towns and cities. Throughout, the guiding question should be how to achieve inclusive urban development in the interest of citizens' well-being and environmental protection.

In exploring the role of cities as places of innovation, Section 2 highlights the necessary interplay between technological, social and organizational innovation, and sets out four challenges for innovation in the name of the smart city. Section 3 provides an overview of emergent frontier technologies centring upon the convergence of green and smart technology, and how these may be variously adapted to local contexts. Section 4 takes a closer look at how the combined forces of digitalization and automation are transforming the world of work and how this will likely affect cities. Section 5 examines how cities can respond to both the digital divide and environmental divide arising from technological innovations, which risk creating new, as well as exacerbating existing, urban inequalities. Section 6 turns to the opportunities of connected and digital technologies to enhance participatory governance through more open e-government, civic engagement and community technology making. Section 7 draws attention to the benefits of responsible innovation as a tool for assessing both opportunities and risks of technology. Finally, Section 8 concludes with seven policy lessons for inclusive socio-technical innovations for urban futures.

9.1. Future Cities as Places of Innovation

The role of cities as places of innovation arises from two key urban characteristics. The first relates to the concentration of people and organizations in dense space which creates the conditions for dynamic resource sharing, networking and collaboration. This agglomeration effect has been shown to be critical for enabling and driving innovation (Chapter 4).[2] Consequently, cities play an important role as hosts in providing an enabling environment for innovation. The second characteristic relates to cities' own role as innovators. This is most obvious in relation to the development and improvement of physical infrastructures,

including buildings, energy, transport, water, waste, and green and public space. It is also increasingly evident in relation to soft infrastructure, where digital technological systems are key to the delivery of various public services. Urban innovation, however, goes beyond the technological, encompassing essential social and institutional aspects. Furthermore, it requires a context-specific, localized approach.

9.1.1. Combining three innovation perspectives

The thriving cities of the future will likely be ones that recognize and harness opportunities to act as platforms for innovation. Consequently, they will facilitate locally grounded innovation ecosystems by supporting the co-location of research organizations, start-up companies, investors, industries, and business and social enterprises. A 2018 survey showed that committed leadership and dedicated staff support are important enabling factors (Figure 9.1). They will use various instruments, including grants, subsidies, competitions and regulations, to incentivize and steer innovation towards sustainable urban development practices. They may establish innovation districts, living labs or other neighbourhood-scale amenities to provide an enabling environment for creative thinking, design, development and, ultimately, the applications of solutions to societal challenges. Finally, they will tailor innovation to local conditions taking into account, for example, available resources, capacities, and social and cultural practices.

In the present day, however, investment in innovation by city governments is still a relatively new phenomenon and remains a marginal practice according to a 2019 OECD report.[3] Of the surveyed cities, just over half had stated innovation goals and fewer than half had adopted innovation strategies. Those that did were found to approach innovation more holistically and were more open to pursuing change. In response to the findings, 60 mayors from the OECD Champion Mayors for Inclusive Growth Initiative adopted the Athens Road Map, which aimed to provide guidance on increasing cities' innovation capacity and capabilities and, in turn, fostering prosperity and well-being.[4] The initiative emphasizes the importance of pursuing innovation not in narrow technological terms, but with close regard to wider socioeconomic and cultural needs and conditions. As such, it urges cities to invest concurrently in three interlinking types of innovation:

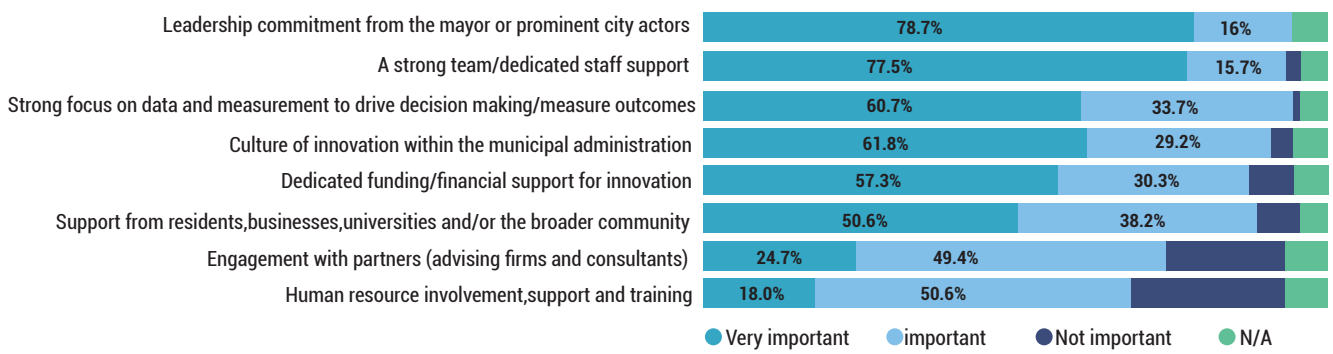
- Technological and digital innovation that contributes to increased well-being in urban areas through smart transformations of public services, ranging from e-government solutions to the use of sensors to address environmental pollution. Participating cities also commit to supporting underserved residents with better access to digital services.

- Social innovation to create better social outcomes through the provision of community services for disadvantaged communities, the creation of targeted employment and activation programmes, and the encouragement of social enterprises and community-building activities.

- Public sector innovation to put the interests of diverse local communities more centre-stage. Recommendations include participatory budgeting, public innovation labs, or citizen-led monitoring to increase engagement of citizens in urban decision-making processes. City governments are equally encouraged to promote public-private partnerships and collaboration between municipalities.

The thriving cities of the future will likely be ones that recognize and harness opportunities to act as platforms for innovation

Figure 9.1: Most important practices to support innovation in cities



Source: OECD, 2019.

Smart city technologies © Zapp2Photo/Shutterstock

9.1.2. Localized and inclusive innovation

An important recognition in recent research and policy is the need for localized and inclusive approaches to fostering innovation. This conclusion was reflected in a collection of discussion papers by UN-Habitat on technological innovation for future cities.[5] Similarly, a recent report by OECD called for the broadening of innovation policies for cities and regions.[6] By broadening, the OECD referred to the need to go beyond a conceptually and spatially narrow approach to innovation (concentrated around a few clusters of excellence) and instead support innovation diffusion through the involvement of a broader set of urban actors and better use of local assets. This approach recognizes the heterogeneity of innovation capacities, with implications for how innovation is orchestrated nationally and implemented locally.

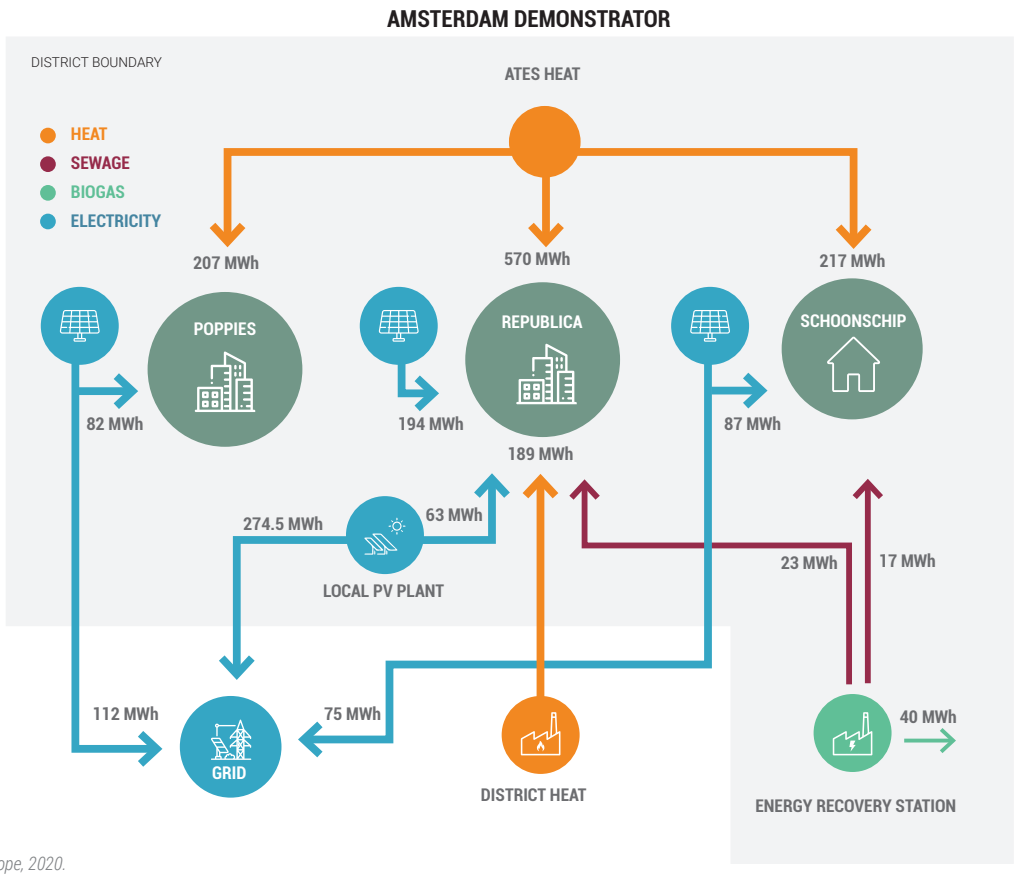
Such an approach considers different spatial and territorial dimensions at work.[7] On one hand, developing a city-regional approach is considered important if the aim is to broaden the innovation ecosystem and scale up efficiencies (e.g. shared infrastructures and services). On the other, recent research has focused on the neighbourhood as a useful unit at which to support smaller-scale, adaptive innovation practices with local expertise. This scale makes particular sense where the sustainability transition calls for more decentralized approaches. For example, the Joint Programming Initiative Urban Europe has a programme to plan and deploy 100 positive energy districts and neighborhoods across 20 European countries by 2025. These districts and neighbourhoods will produce more energy than they consume, through combing a diverse range of energy sources and energy transfers (Figure 9.2).[8]

A further direction in recent urban innovation policy and practice is the strategic alignment of innovation activities with grand societal challenges. This concern recognizes that innovation can result in destructive creation that leads to greater inequalities and environmental degradation.[9] Instead, cities are expected to steer innovation towards the sustainability transition and use it to tackle urban challenges, such as environmental pollution and rapid urbanization.

In summary, it is possible to define some qualitative indicators of what kind of innovation policy and practice can be envisaged for future cities. Accordingly, municipal governments would strive to:

- Align innovation policy and practice with grand societal challenges, including climate change, pollution, poverty, and inequalities as identified in various chapters of this Report
- Support urban agglomeration, and in particular the co-location of complementary resources and organizations, through territorial and socio-economic planning and regulation (see Chapter 6)
- Create a conducive environment for technology and entrepreneurial start-up companies, especially in the green and smart technological sectors
- Facilitate partnerships involving a variety of actors (including intermediaries) within and outside the public sector

Figure 9.2: Diagram showing the flows of energy in a 'positive energy district'



Source: Urban Europe, 2020.

- Support urban experimentation (pilots, incubators, living labs) aimed at addressing societal problems
- Support training and skills development, including upskilling to green jobs and digitalization
- Host or support "future labs" that engage stakeholders and communities in vision-making and scenario-building
- Conduct evaluations of innovation programmes to assess impact and ensure feedback for continuous improvement, learning and capacity building

9.1.3. Four challenges for smart city innovation

The "smart city" has become a globally popular catchphrase and major policy paradigm for technology-driven urban innovation and development. It emerged rapidly from the late 2000s onwards to jockey for local authorities' attention alongside other key urban conceptual paradigms, such as the "compact city," "resilient city" or even the longtime dominant "sustainable city."[10] Within just five years (2015–2019), the scientific output on smart cities rose tenfold. This picture of rapid growth is mirrored in the global market, where the demand for smart city systems and solutions is estimated to increase annually by 25 per cent, with an overall market value of approximately US$517 billion.[11] It is further reflected in the popularity of diverse smart city initiatives around the world. According to a recent global survey, 27 cities currently lead the field as smart city champions, followed by numerous others that have launched initiatives under the smart city banner.[12] Of course, having an explicit smart city agenda is not a precondition for cities adopting connected and digital technologies: indeed, some local governments have implemented artificial intelligence (AI) technology without specific reference to smart city.[13]

Cities are expected to steer innovation towards the sustainability transition and use it to tackle urban challenges

The "smart city" has become a globally popular catchphrase and major policy paradigm for technology-driven urban innovation and development

Nevertheless, many municipal administrations choose to adopt a smart city agenda, to provide strategic and programmatic direction for urban development. They are often encouraged by national governments that use competitions to entice cities to invest in smart city programmes, as illustrated by India's 100 Smart Cities Mission and the Republic of Korea's Smart Challenge. National and international standards organizations have joined in by issuing indicators and frameworks aimed at guiding cities' work on the ground.[14]

What transpires from many of the recent smart city initiatives is that they place great importance on promoting governance innovation, alongside the more technical rollout of digital technologies such as public Wi-Fi, smart street furniture and open data portals. For example, Amsterdam Smart City styles itself as an "open innovation platform" aimed at connecting people and supporting collaborative approaches to find solutions to urban challenges.[15] Similarly, Melbourne's smart city programme comprises a CityLab, described as a space to prototype new city services with the community, and an annual Open Innovation Competition, which seeks to tap into the creativity and expertise of the community to solve a given city issue (e.g. waste and the circular economy in 2020).[16] In the case of Santiago de Chile's Shared Street for Low-Carbon District initiative, which was spearheaded by an NGO in collaboration with the municipality and the smart cities unit of the Ministry of Transportation, the aim was to combine citizen participation and experimentation to support tactical interventions for more inclusive and sustainable road use.[17] Altogether, rather than starting from a fixed model of the smart city, many recent initiatives emphasize an experimental, open-ended approach to developing solutions to localized urban issues with the involvement of multiple stakeholders.

Many municipal administrations choose to adopt a smart city agenda, to provide strategic and programmatic direction for urban development

Nevertheless, smart city initiatives have faced significant criticism, highlighting the risk of an overly technological approach to innovation without due regard to diverse urban and social contexts. Therefore, cities wishing to implement smart city strategies need to contend with four main challenges.

- **Respect city-specific contexts**, otherwise smart city projects risk being divorced from the reality of ordinary cities if they subscribe to a form of smart urbanism that espouses a clean slate view of a city run on hyper-efficient urban technology.[18] In response, researchers and practitioners have urged a more grounded approach, which situates the smart city within specific locales and socio-political contexts, thereby relating it to the messy reality of urban policy and practice.[19]

- **Adopt a people-centred perspective** to avoid the risk of an overly technocratic approach to how smart city initiatives are conceived and implemented.[20] There is broad acknowledgement that, initially at least, smart city initiatives too often acted in the service of technology and corporate interests aimed at expanding new urban markets for digital technologies. Consequently, a more people-centred approach has been recommended, which emphasizes that smart cities should more explicitly serve the interests of citizens and give them an active role in how these technologies are planned and implemented.[21] However, if such a commitment is to be more than cursory and paternalistic, it requires serious engagement with questions of social justice, the social good and political participation, for example by operating under the right to the city framework.[22]

- **Provincialize smart cities** in order to view the smart city from a different perspective than that of the Global North. The predominant view is problematic when smart city practices developed in Western cities with knowledge-based economies and concentrations of global capital are uncritically assumed to be suitable for, and therefore superimposed on, cities in developing countries. In response, critical scholarship has highlighted the need to provincialize smart cities; that is, to develop more grounded approaches to how smart city discourses and practices can emerge from global peripheries, often in the form of small projects (in contrast to typically large-scale, capital-intensive interventions in the Global North).[23]

- **Ensure environmental sustainability** as there is a major concern that current smart city discourse insufficiently

Smart city initiatives have faced significant criticism, highlighting the risk of an overly technological approach to innovation without due regard to diverse urban and social contexts

engages with environmental sustainability issues. On one hand, smart city initiatives can be criticized for often prioritizing economic goals—expressed, for example, in terms of seizing global marketshare—and, consequently, marginalizing environmental goals.[24] On the other hand, the environmental costs of smart city projects are frequently overlooked, when there is growing evidence that technological innovations may be carbon intensive and environmentally damaging.[25] Recent years have, therefore, seen a shift towards more explicitly aligning the smart city with the goals of the sustainable city.[26]

Overall, the discussion of what innovation policy cities should pursue highlights the importance of a concerted approach that interrelates technological, social and public sector innovation. It further highlights the need for a variegated approach that pays attention to different types of cities and urban contexts, in order to achieve thriving, locally grounded innovation practices. It also underscores the importance of aligning innovation policy with major social policy goals, such as ensuring adequate housing, tackling poverty and improving sanitation. These insights are increasingly recognized in the development and application of emergent urban technologies, as the following section outlines.

9.2. Frontier Technologies for Variegated Urban Futures

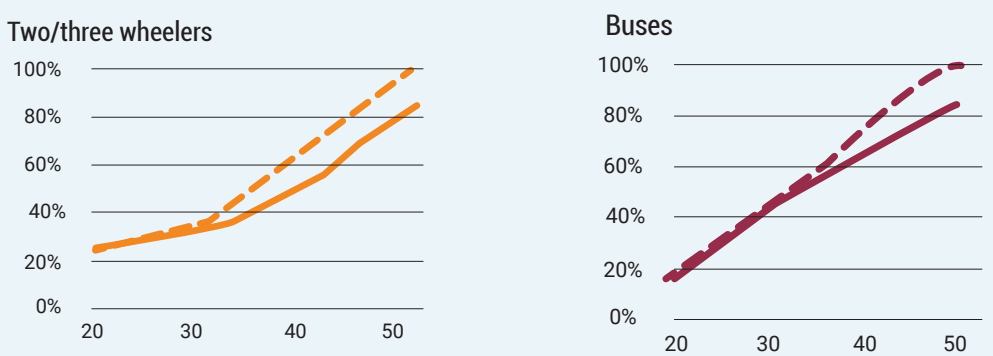
Urban futures will be defined to a significant extent by a series of frontier technologies, particularly relating to the green and smart technology sectors. Frontier technologies are innovations in science, technology, engineering and mathematics which are no longer in the research and development phrase but have yet to see mainstream market penetration and public adoption (Box 9.1). Their application in the urban realm has the potential to reconfigure urban development in radical and disruptive ways. The adoption of frontier technologies is not limited to large, global cities, but is increasingly relevant in lower-tiered cities and even informal settlements. This is because frontier technologies can be designed to be relatively low-cost and suitable for local adaptation. Still, a significant problem remains that some technological innovations, driven by global corporate interests, are either unattainable in resource-poor contexts or in their application exacerbate social inequalities, thus leaving some cities behind. Consequently, urban institutions and stakeholders should be actively involved in deciding how urban technologies are designed and adapted locally in pursuit of sustainable urban development.

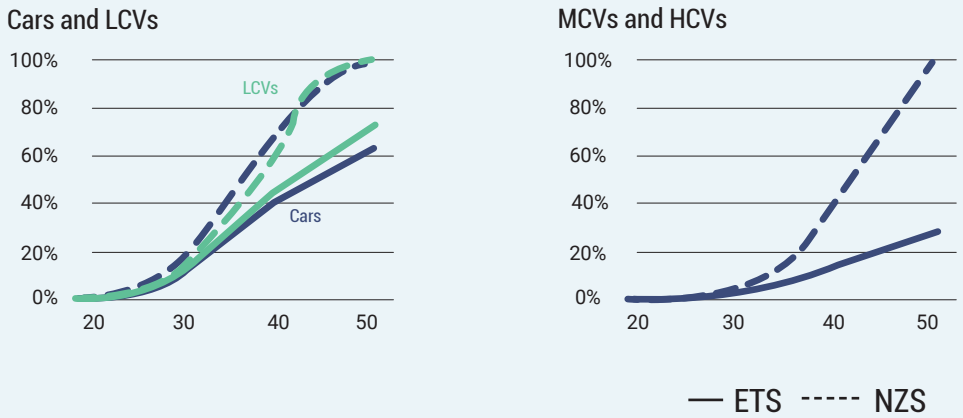
Co-workers at the iHub, a working space for technology entrepreneurs, Nairobi, Kenya. © rvdw images/Shutterstock

Box 9.1: Examples of frontier technologies in urban contexts

- **Artificial intelligence**, or machine learning: Increasingly deployed by municipal governments in the form of virtual agents like chatbots for issuing parking permits and in road traffic management.[27]
- **Blockchain**, or distributed ledger technology: For secure, decentralized exchange of data among network partners. Used by transport operators to deliver shared mobility services, or by city governments to issue residents with digital identifiers for accessing local services.[28]
- **Digital twins**: Virtual representations of urban objects at various scales (building, neighborhood, district, etc.) used as planning tools. Supports diagnostic and prognostic analysis and model-making. Dependent on completeness and accuracy of underlying data known as "digital thread." [29]
- **3D printing**, or additive manufacturing: Allows for offsite fabrication of building components, thus potentially lowering construction costs of new buildings.[30]
- **Electric vehicle (EV) technology**: With a global target of 60 per cent EV cars by 2030, a rapid uptake is required given the current share of just 4 per cent. (In comparison, EVs already make up 39 per cent of buses.) A key technological challenge is the roll-out of electric charging networks. To date, 15 countries and 31 cities are committed to phasing out the sale of combustion-engine vehicles.[31]
- **Internet of Things (IoT)**: Broad range of applications by embedding a multitude of sensors, smart meters and computer processors in urban infrastructure and objects (buildings, electricity grids, street furniture, water grids, etc.) and connecting these to digital management systems via cloud computing (remote storage and analysis system over the internet)[32].
- **Renewable energy technologies**: Deployed for clean energy production, using various renewable energy sources (solar, wind, hydro, biomass, geothermal). Potential to be applied in tandem, e.g. large bioenergy and waste-to-energy plants with distributed networks of solar panels.[33]
- **Robotics**: Multiple urban applications, including drones for last-mile delivery and connected autonomous vehicles (CAVs). Dependent on 5G/6G technology to deliver high-speed broadband, ultra-reliable connectivity (for low latency) and ability to connect to a multitude of devices simultaneously.[34]

Zero-emission vehicle fleet share outlooks-Economic Transition Scenario (ETS) and Net Zero Scenario (NZS)





Source: BNEF. Note: 'ETS' is Economic Transition Scenario and 'NZS is Net-Zero Scenarion'. 'LCVs, MCVs and HCVs' are light-, medium- and heavy-duty commercial vehicles. 'Zero-emission' includes battery-electric and fuel cell vehicles. All values globals. Some values rounded.

Source: BloombergNEF, 2021.

9.2.1. Converging smart and green technologies

The rise of various green technologies corresponds with the scale and urgency of environmental challenges (Chapter 5). According to the World Energy Outlook only 40 per cent of the CO_2 emission cuts required to reach the 2050 net zero target will be achieved with current measures.[35] Therefore, the uptake of environmental technologies (currently increasing by over 8 per cent annually, as measured by investment) will need to accelerate significantly in the coming years.[36] The decarbonization of energy grids, the electrification of transportation and the application of renewable energy technologies to commercial and domestic buildings are among the most important areas that require innovation and implementation.

For its part, the smart technology sector has grown exponentially based on rapid advancements in digital and connected technologies and their ubiquity in everyday life. The speed with which cities are adopting smart technology is illustrated by strong demand for Internet of Things (IoT) technology, with over 20 per cent annual growth forecast for the coming years.[37] Similarly, blockchain technology is predicted to grow by over 30 per cent in the next few years.[38] AI technologies are increasingly deployed by municipal governments in the form of virtual agents like chatbots.[39] Overall, the market for smart city systems and solutions is estimated to be US$517 billion.[40]

More than their individual contributions, however, it is the convergence of green and smart technologies that creates the basis for major, and potentially disruptive, urban change. For example, the application of IoT and blockchain technologies in combination with renewable energy technologies makes it increasingly technically feasible and financially affordable to set up virtual power plants. These are decentralized, local energy grids that can utilize multiple renewable energy sources and, thus, reduce CO_2 emissions and increase energy resilience. Likewise, modern district heating systems combine renewable technologies (waste heat, heat pumps, thermal storage, etc.) with digital and connected technologies to achieve increased energy efficiency. According to the United Nations Environmental Programme, they are "a secret weapon for climate action and human health," with potential to reduce primary energy consumption by up to 50 per cent compared with conventional systems.[41] Both examples point to the opportunity for small-scale, localized approaches (also known as "off-grid" energy), with technology configured to suit specific local conditions.

A similar technological interplay is required to realize the goals of the circular economy, which seeks to change the prevailing linear production mode (so-called "take-make-dispose") to a closed production cycle where product owners repair, recover, reuse and recycle their goods.[42] Cloud computing and business-to-business matching platforms are enabling technologies to connect waste producers with waste recycling and remanufacturing industries. Blockchain technology can improve the traceability and transparency of

The smart technology sector has grown exponentially based on rapid advancements in digital and connected technologies and their ubiquity in everyday life

Home electricity scheme with battery energy storage system on modern house photovoltaic solar panels and rechargeable li-ion backup. © Upetovarga/Shutterstock

products by verifying the origins of products and assuring related sustainability claims.

9.2.2. Low-cost applications

The example of virtual power plants demonstrates that frontier technology need not necessarily be unaffordable. Such plants can be designed to allow individual households, groups of residents or neighborhoods to sell surplus electricity to the wider electricity grid, thus generating local income for residents alongside their contribution to decarbonizing the energy system.

While the costs of new infrastructure development are typically high—and as such may be out of reach for less well-resourced cities—a focus on improving existing infrastructure is often more appropriate and less costly. According to a report by McKinsey on infrastructure options for future cities, even relatively simple and inexpensive digital overlays—such as low-cost automated utility meters and air quality monitors, low-power Wi-Fi communication for intermitted data-streaming, and advancements in solar panel battery technology delivering more power at lower cost—can render existing infrastructure "smart" at affordable prices.[43]

The question of high-versus-low costs also applies to waste management. At the high end, a study by the European Environment Agency argues that the future of waste management will be characterized by the convergence of five technological innovations, namely: (a) robotics that use image recognition for pneumatic sorting; (b) AI and machine learning for waste classification, such as CAV refuse trucks; (c) IoT for sensor-supported waste containers (e.g. smart bins); (d) cloud computing for storing and processing sensor data as well as workflow management; and (e) data analytics to evaluate performance and model alternative options (figure 9.3).[44]

The report, however, acknowledges several potential deterrents: high investment costs, the requirement for advanced digital skills, the prospect of generating additional electronic waste and increasing energy consumption. Echoing this concern, a World Bank report emphasized that appropriate technological solutions to tackling waste may not be the newest or most advanced, depending on context.[45] This is important given that 90 per cent of solid waste is openly dumped or burned in low-income countries, and worldwide 33 per cent of municipal waste is not managed in an environmentally safe way, partly due to the high cost of waste management.[46]

Similarly, the availability of affordable technological solutions to tackle the growing problem of water scarcity and sanitation is a recognized challenge. There are some noteworthy case studies that demonstrate how technology can be applied in resource-poor settings, thus providing clean and affordable water to local communities.[47] Here again, increasingly several technologies interact, with digital overlays adding remote sensing and smart metering capabilities. The trend is towards more small-grid and hybrid-grid water management systems aimed at increasing efficiency and resilience.[48]

Figure 9.3: Five technological innovations that will shape the future of waste management

	ROBOTICS	ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS	INTERNET OF THINGS	CLOUD COMPUTING	DATA ANALYTICS
PROCESS	Advancements in the pneumatic sorting process as a result of autimation technology allow producing defined waste streams of high purity (over 90%)	Machine learning-using neural networks based on the use of data or examples to solve problems without explicit programming-is used for classification and pattern recognition in the waste management context, improving the efficiency of sorting.	As more and more devices are connected to the internet or other networks,sensor supported containers can collect data and transfer it to central units.	Storing and processing of sensor data and cloud based software solutions make it easy to optimize workflowsw and document failure to collect,failure in sorting or detect waste bins that are not paid for.	Storing and processing of sensor data and cloud based software solutions make it easy to optimize workflowsw and document failure to collect,failure in sorting or detect waste bins that are not paid for.
EXAMPLES	Robots that are able to identify and sort recyclables and critical materials through image recognition/IR scanning/AI vision systems when dismantling used phones/electronics.	Autonomous,self-driving street sweepers,refuse trucks	Smart waste bins with identification systems,weighing systems,level sensors,software for optimizing logistics	Cloud based software for: - Connection,standardizing and optimizing internal procedures. - Real-time order management route planning and optimization,customer self-service,order tracking and evaluation.	- Electronically supported disposition of waste collection vehicles. - Evaluation of sensor data for automated sorting plans. - Control of waste incineration plants - Drone based data collection on landfills.

Source: EEA, 2021b.

9.2.3. Flexible and modular designs

Concomitant with a focus on small-scale, localized approaches, technological innovations are increasingly characterized by flexible and modular designs. A case in point is mobile air quality monitoring, in response to the worldwide problem of urban air pollution which afflicts 9 out of 10 people on a daily basis.[49] The example of Breathe London, a recent pilot study undertaken by the Environmental Defense Fund, demonstrates the feasibility and flexibility of lower-cost and more portable monitoring using sensor pods, as alternative to more costly traditional environmental monitoring technology.[50] The approach is particularly suitable for generating high granularity of data for targeted, hyper-local action, such as dealing with pollution hotspots, and measuring the impacts of intervention. The underlying technological approach has been made available as a blueprint for use in other cities.[51]

Modularity and flexibility are also characteristic of new approaches to urban transportation. Enabled by technological innovations, including electric and connected autonomous vehicles, the future of urban transport will be more multimodal with emphasis on mobility-as-a-service (on-demand ridehailing and car-sharing), micro-mobility (e-scooters, e-bikes and e-light freight vehicles), last-mile and last-minute delivery (drones and robots), and active travel (walking and cycling). This will require both integrated physical infrastructure and interconnected

transport management systems. It will also require attention to multiple aims, including reducing air/noise pollution, increasing safety and improving congestion.[52]

9.2.4. On-the-ground partnerships

If a key feature of future urban technologies is small-scale designs and local adaptability, then the need for on-the-ground partnerships becomes apparent. One such example comes from Norway, where 11 towns making up the Rogland region teamed up to upgrade street and park lighting using LED technology.[53] Rather than opting for outsourcing, the project was developed by an industrial company owned by the municipalities, and it is based on an open system design to allow for future IoT functionalities to be added. It resulted in the installation of 18,000 LED lighting poles that are interlinked via a central management system. Elsewhere, the need for cooperation is also critical to achieving more sustainable building design and operations. Buildings contribute an estimated 37 per cent of global CO_2 emissions and account for 36 per cent of global energy consumption.[54] Approximately one-third of emissions stems from construction activities and two-thirds relate to building operations. These sources highlight the importance of applying life-cycle assessment to the building sector: design, planning, construction, operation, renovation and demolition. Apart from environmental technologies (e.g. active and passive solar power; recycled materials for insulation; green roofs), smart technologies are used for building operation as well as to optimize energy efficiency and monitor performance. This essentially requires the active involvement of, and cooperation from, building operations managers and users, whether residents or commercial tenants.

Digital technologies can be used to enhance collaborative planning and decision-making (Chapter 6). Municipal governments and other urban actors have access to growing amounts of large-scale and high-resolution data harvested from diverse sources, including from distributed sensors, closed-circuit television cameras and social media. Digital twin technology is increasingly used in urban design and planning. Geographic digital twins are virtual representations of urban objects at various scales. As digital counterparts of the urban fabric, they can be used as planning tools, by providing diagnostic and prognostic analysis and enabling model-making. The technology, however, is dependent on the completeness and accuracy of the digital thread, the underlying data-driven architecture.

While recognizing the limits of technological sovereignty, city governments have an opportunity to pursue an active role in setting the technological agenda for urban futures. In doing so, the focus should be on supporting technological development and finding technological solutions that are attuned to local conditions, tackle pressing urban challenges, and are socio-economically and culturally inclusive. Cities need to be prepared for, and actively address, technological advances and their likely impacts, such as those arising from automation and digitalization, as the following sections sets out.

9.3. Automation, Digitalization and the Future of Work

According to the World Economic Forum (WEF), by the year 2025, machines will equal humans in terms of time spent on tasks at work.[55] Automation, alongside digitalization and new hybrid forms of work, are expected to transform established modes of labour and employment and, consequently, change urban economies. Digital platforms, for example, create new digital-urban connections with visible impacts on streetscapes and urban trade and services. The COVID-19 pandemic has accelerated these emergent transformations. The WEF report aptly speaks of a "double disruption" confronting the world of work: one caused by connected and digital technologies; the other by the pandemic rupture. City governments, as policymakers, regulators and employers, have a stake in the discussion about how technological innovation should shape the future of work and knowledge-based urban development.

City governments, as policymakers, regulators and employers, have a stake in the discussion about how technological innovation should shape the future of work

9.3.1. Transformations across formal and informal economies

The future of work, in the form of the ubiquitous use of connected and digital technologies, has already arrived for a large proportion of the white-collar workforce.[56] Many public and private sector organizations routinely use cloud computing and big data analytics while consumer-oriented businesses have increasingly embraced e-commerce. Algorithmic management, which relies on data collection and surveillance technology to remotely track and manage workforces, is becoming more commonplace, especially in developed countries.[57]

In emerging and developing countries, the evidence of the impact of digitalization is not yet conclusive, according to the German Agency for International Cooperation (GIZ).[58]

Box 9.2: Digital microwork in an informal settlement in Windhoek

Microwork platforms have attracted growing interest as a promising tool to support work in the informal economy and in areas of high unemployment. They give users access to various short-term Internet-based microtasks, such as transcribing short texts, moderating content and tagging images. Work can be carried out one task at a time from home, thus offering flexibility and remote access. In an experiment on the outskirts of Windhoek, researchers designed a simulation of a range of microtasks for which payment was made.

The aim was to find out what livelihood assets are needed to allow people to pursue microwork, and whether doing so results in improved livelihood outcomes. Volunteers were given training to act as technology mediators so that they themselves could train and support their community. The project concluded that several conditions had to be met for microwork to be a viable option, including: English language skills and digital literacy; physical access to electricity and the Internet; email and bank account ownership; and financial means to pay platform membership fees.

Source: Keskinen et al, 2021.

It cites evidence from five Association of Southeast Asian Nations (ASEAN) countries showing that, in the formal economy, up to 56 per cent of jobs are threatened by digitalization and automation. Corresponding data on the informal economy are more difficult to come by because it is expansive and diversified, encompassing an estimated 2 billion workers across the Global South.[59] Nevertheless, GIZ highlights employment opportunities in the platform economy,[60] and improvements in productivity flowing from technological innovation.

For the G20 intergovernmental forum, digitalization offers an unprecedented opportunity for self-employed individuals as well as small and medium enterprises.[61] Connected and digital technologies can facilitate access to financial services, seen as critical for supporting inclusive and sustainable development. The G20 policy guide highlights the scale of the task, since 1.7 billion adults worldwide lack access to a basic bank or mobile money account. Particularly, women should benefit from digital connectivity, since they make up the largest group across different sectors within the informal economy.

An example of the importance of digital tools for female entrepreneurship is reported in a case study of informal markets in Ghana.[62] There, ICTs, and in particular mobile phones, form an essential part of women's trading practices, providing access to banking services and information on farm pricing, as well as supporting multiple social networks which are central to managing their micro-enterprises. In Namibia, where well over 50 per cent of the work takes place in the informal economy, the benefits of microwork were explored in a community-based experiment in Windhoek (Box 9.2).[63]

Digital labour platforms epitomize the advancing digitalization across formal and informal economies. They exhibit a strong urban dimension: platforms benefit from high population density and spatial proximity between platform users and workers.[64] This dynamic is so significant that captured by the term platform urbanism'.[65] City governments themselves often become involved, for example in an oversight and regulatory capacity to provide licenses to drivers and food safety certificates to restaurants. Indeed, some city governments have participated in legal challenges, for example to force ride-hailing platforms to be treated as transportation companies rather than merely as technology enterprises.[66]

Yet, there are growing concerns that digital labour platforms create a precarious class of underpaid urban workers with little social protection.[67] Research in South-Eastern Asia and Sub-Saharan Africa has shown that platform work can result in irregular worktime, overwork, sleep deprivation, and social isolation, apart from generating low pay.[68] Of particular worry for cities must be the prospect of increased inequality between a growing group of precarious platform workers and a high-income class of residents.[69] These concerns, however, have to be set against the attractiveness—typically emphasized by platform workers themselves—of flexibility, autonomy, additional income and low-entry barriers to urban labour markets.[70]

There are growing concerns that digital labour platforms create a precarious class of underpaid urban workers with little social protection

9.3.2. Advancing automation in cities

Alongside digital transformations, the substitution of human workers with technology is advancing rapidly. In developing countries, two-thirds of jobs could be automated, particularly in formal economies where wages and rates of technological adaptation are high.[71] Similar trends can be observed in developed countries. In the US, up to 47 per cent of employment is estimated to be at risk of automation, particularly affecting jobs in the services and administrative sectors.[72] In the UK, following the example of multinational technology company Amazon, two major national supermarket chains began trialing automation technology in 2021, including camera surveillance and automated billing, that would dispense with retail staff. In municipal service provision, automation plays a growing role. For example, chatbots or virtual agents increasingly replace municipal staff, such as in Helsinki, Finland, where chatbots help process residents' parking permit applications.[73] Another area of application is waste collection based on automated air suction systems and underground pipes.[74] The city of Yavne, Israel, boasts one of the world's most advanced automated waste collection systems, covering homes, schools and public bins.[75] In urban public transport, driverless buses are rapidly becoming common features, such as in Malaga, Spain, and Wuxi, China.[76]

9.3.4. Beyond the pandemic: scenarios for the future of urban work

The COVID-19 pandemic will likely have a lasting effect on the world of work by accelerating automation and digitalization. The need for social distancing hastened the introduction of self-service customer kiosks and the use of service robots in customer interaction areas.[77] Additionally, the pandemic also changed the spatiality of work from the predominant physical mode of work fixed in one place to flexible, hybrid work practices. Despite the difficulty of predicting the winners and losers among cities of the pandemic's long-term effects,[78] it is possible to consider at several scenarios for the future of work and urban development.

In developing countries, two-thirds of jobs could be automated, particularly in formal economies where wages and rates of technological adaptation are high

The double disruption, as described by the World Economic Forum, is likely to continue to reshape the labour market. The International Labour Organization emphasized the likely further increase in inequalities between low- and high-paid workers arising from the type of job losses generated by the pandemic.[79] This will necessarily lead to changes in the mix of occupations and, therefore, require retraining and upskilling.[80] Changes in the retail sector may be particularly pronounced. The high street "retail apocalypse,"[81] already underway before the pandemic, is likely going to make more jobs in large service sectors obsolete. The increase in online retail from 16 per cent of total sales pre-pandemic to 19 per cent globally is likely to accelerate further.[82] The McKinsey Global Institute highlights the need for preparedness for changes in the mix of occupations: it estimates that 25 per cent of workers will need to switch occupations, with jobs in warehousing and transportation increasing, while those in customer-facing sales falling. On their part, digital platforms can be expected to grow and diversify which, while providing work opportunities across developing and developed economies, may add to the precarity of workers.

The COVID-19 pandemic will likely have a lasting effect on the world of work by accelerating automation and digitalization

The enforced lockdowns and subsequent sudden shift to remote working resulted in an abrupt decrease in transportation, coupled with a reduction in air pollution and greenhouse gas emissions (Chapter 6).[83] This led some to predict that new modes of hybrid working will have positive environmental externalities.[84] However, recent evidence points to a rebound effect, as more people switched from public transport to private car use since social distancing is easier to maintain.[85] In addition, growing demand for online shopping and last-mile delivery have led to an increase in road traffic.[86] City administrations, thus, need to analyze how these trends may require investment in sustainable micro-mobility solutions.

As remote and hybrid working practices allow people to live and work at greater distance from urban centers where offices and headquarters are concentrated, smaller cities and suburban areas may benefit relative to larger ones.[87] However, this depends on the availability of suitable infrastructure such as broadband coverage and co-working spaces. Indeed, smaller cities and suburban areas may use the opportunity of the pandemic to invest in urban improvements to increase their attractiveness to footloose remote workers.

Yet, according to a US study, smaller cities may also be expected to experience negative long-term consequences, as they are home to a larger proportion of jobs that can be automated, thus leading to job losses.[88] By the same analysis, large cities may be less affected, given the concentration of highly skilled technical and managerial professions that are less prone to automation. Other research on European and Northern American urban economies predicts a more polarized scenario among large cities, depending on the economic specialization and skillsets of local workforces: cities with higher shares of jobs considered low-skilled (such as in certain service sectors) or high-skilled (for example in biosciences and engineering) may enjoy greater resilience, while those with large medium-skilled workforces (such as in manufacturing or administration) could face high unemployment.[89] The various options for city governments to enhance the attractiveness of locations for businesses and workers include tax incentives and making targeted infrastructure investments.[90]

9.3.5. City-level initiatives to prepare for the future of work

While the implications of the pandemic's double disruption for urban development are yet to crystallize fully, cities would be well advised to prepare urban workers for potential negative impacts. For example, Calgary promotes the reskilling of residents through a dedicated technological skills development programme, in response to the decline of its traditional fossil fuel industries.[91] The government of Singapore offers SkillsFuture, a retraining programme that consists of short modular courses in emerging areas, such as advanced manufacturing, data analytics and urban solutions.[92] Citizens each receive an allowance of SG$500 to sign up for a SkillsFuture course, with more than 431,000 Singaporeans benefitting to date.[93]

Basic income trials are another possible policy intervention, by providing an unconditional monthly income to alleviate the need to engage in precarious and short-term work. For instance, the city of Stockton in the US undertook a two-year trial by offering a selected group of low-income residents a monthly basic income of US$500, which resulted in lower unemployment and improved well-being (Chapter 1).[94] In Madrid, workers have set up platform cooperatives in response to the rise of corporately-owned digital labour platforms. Owned and run by workers, the cooperatives aim to offer better working conditions than established platforms by providing regular pay and paid leave.[95] Despite the uncertainties surrounding the pandemic's long-term effects, cities have several tools at their disposal to manage the economic and social effects of digitalization and automation and to support their citizens' participation in the knowledge-based economy.

9.4. Cities' Responses to Digital and Environmental Divides

The COVID-19 pandemic demonstrated the opportunities afforded by digital technologies which allowed society to adapt quickly to remote online working, education, health care, retail and entertainment. At the same time, the pandemic revealed that a lack of access to smart technology could exacerbate existing socio-economic inequalities. For instance, in New York access to technology emerged as a fundamental determinant of access to health and social care.[96] Residents on lower incomes, from ethnic minorities, the elderly and immigrants, had significantly lower access to broadband and the Internet than the average population, coupled with lower digital literacy.

This is an example of the digital divide, which not only highlights the challenge that some may benefit more from technological innovations than others but, worse, that the introduction of new technology can further entrench existing socio-economic and cultural disparities, as UN-Habitat has repeatedly highlighted.[97] If, therefore, the aim of urban development as stated in the New Urban Agenda[98] is to promote inclusivity and ensure that all inhabitants have access to various urban services, then active steps need to be taken to avoid technological innovations having adverse effects. This similarly applies to environmental technologies, where the risk of "eco-gentrification" and the emergence of a "climate precariat" are well recognized.[99]

Technological divides are not a problem exclusively for cities in the developing world. Cities in the developed world are also confronted with the challenge of addressing digital and environmental divides among their populations. This section seeks to highlight how various cities (and countries) have responded to the challenge with initiatives aimed at making the applications of technological innovations more inclusive.

9.4.1. Approaches to digital inclusion

The digital divide is more than physical access to digital infrastructure, including broadband and the Internet.[100] It encompasses the affordability of smart technology, the skills required for digital literacy, and whether digital engagement translates into new opportunities, such as employment, education, and social and cultural engagement:

- Access consists of two aspects: the availability of digital infrastructures and digital tools and the affordability of using digital services. The former highlights that digital infrastructure may be unevenly distributed across urban space, with gaps in broadband coverage which, therefore, puts underserved communities at a disadvantage. The latter highlights that, even where physical access is available, there may still be a barrier to accessing digital services on cost grounds. Figure 9.4 shows how even in a city like New York, many households are without internet. Expanding the spatial reach of digital infrastructure is seen as the most fundamental requirement to counteract the digital divide.[101] Improving physical access to digital infrastructure alone will not suffice; questions related to affordability, skills development and the productive use of digital tools for economic activity need to be addressed. Still, physical access remains important: in developing countries, in 2018, about 40–42 per cent of people had access to the Internet compared to 70–98 per cent in developed countries.[102]

- Skills: Even if everyone had physical access to digital tools, inequalities would remain if potential users lacked digital literacy to use digital services and create their own content. This is one of the main challenges identified in the UN-Habitat playbook People-Centered Smart City.[103] This framework points to the importance of skills training. Evidence shows significant inequalities concerning digital literacy and skills afflicting particular social groups. For example, research shows that age, income and level of education were important determinants of people's ability to access and use ICTs in Barcelona.[104] In Magelang, Indonesia, the gulf between digital haves and digital have-nots has widened with over one-third of the city's poor having no access to mobile phones. Additionally, they did not have the skills for advanced use, such as logging on, conducting online searches and retrieving information.[105]

- More recent research has focused on the outcomes of computer and Internet use in terms of who is benefitting, and in what way.[106] This research shows that those on the right side of the digital divide (young, male, well-educated, employed) generally report more positive outcomes economically, socially, politically and culturally, and are better at coping with the negative aspects of Internet use, such as cybercrime, disinformation, and online addiction. For those on the wrong side of the divide (older persons, female, those with low-level education and occupation), the situation is reversed. In least-developed countries the uptake of digital technologies for production, rather than mere consumption, still lags significantly behind more developed countries.[107]

Examples of the digital divide from across the world, as well as initiatives that seek to enahnce digital inclusion are presented in Table 9.1. Concerning the former, not only is there compelling evidence of the urban poor being disproportionally affected, as exemplified by the case of Magelang, but there is also a strong gender factor at play: across low- and middle-income countries, women are 20 per cent less likely than men to use mobile Internet, according to the United Nations Conference on Trade and Development (UNCTAD).[108] Research on Indian urban slums revealed in more detail that women in poor settings are disproportionally affected by a lack of Internet access, not owning an access device (mobile phones, computer), and not knowing how to send text messages.[109]

Another study from India highlighted the digital marginalization of elderly people, who experience multiple barriers to using digital services, including difficulty in understanding technical instructions, concerns over cyber security, and a lack of supportive learning environment.[110] A case study of Dar es Salaam found that a change in mobile phone regulations (mandatory registration of SIM cards) disproportionally affected those living in informal settlements by disrupting users' informal financial transaction methods, with detrimental effects on their livelihoods.[111] Elsewhere, research on Internet exclusion in Santiago and Medellín revealed that households who could afford Internet access and had the necessary user skills nevertheless experienced exclusion for want of sufficient digital infrastructure.[112] This study points to network disadvantage that is institutionally generated. Altogether, these studies highlight the complexity of digital exclusion, requiring urban actors to consider multiple levels of intervention to provide redress.

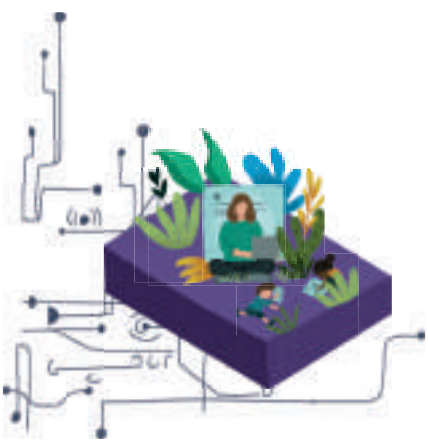
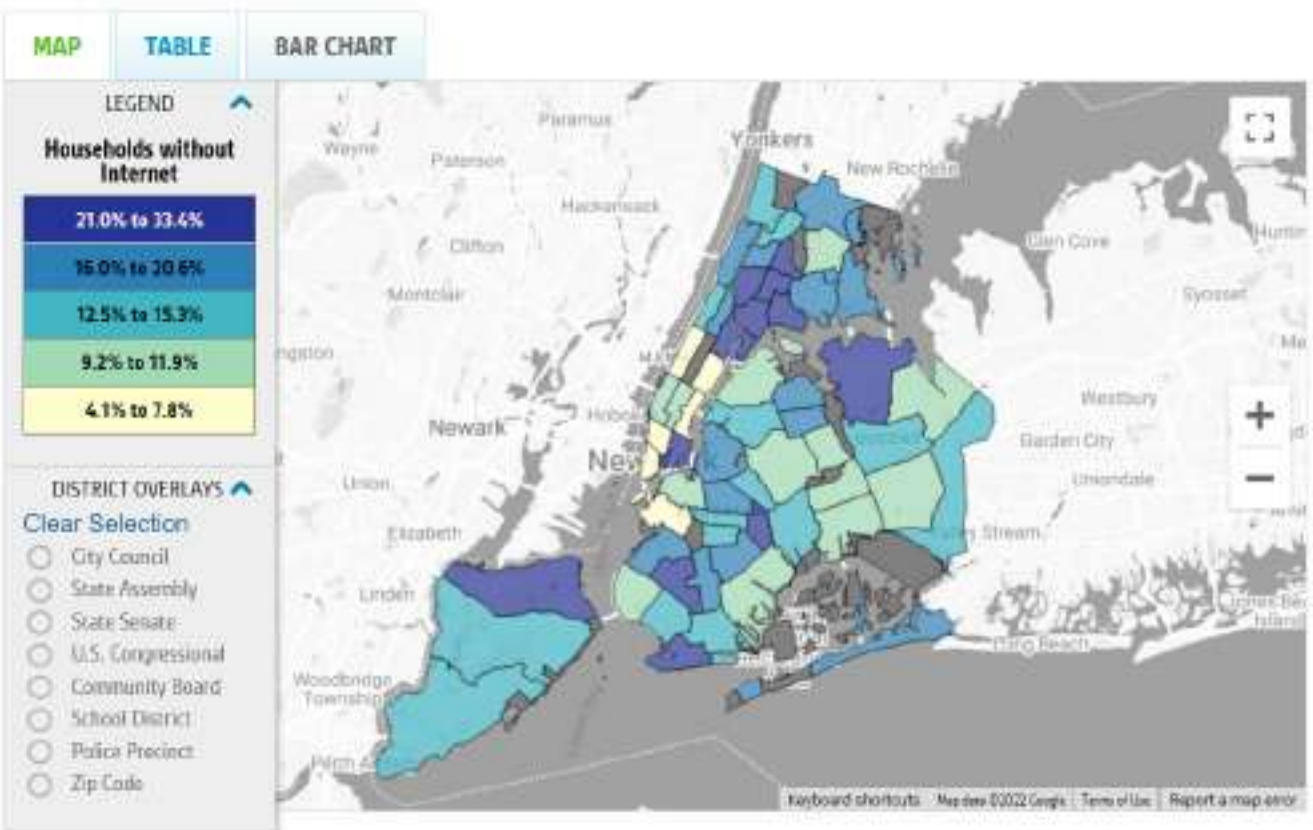


Figure 9.4: Map of New York showing households without internet access: with concentration in the less affluent parts of the Bronx, Queens and Brooklyn



Source: Citizens' Committee for Children of New York, 2019.

Table 9.1: Examples of the digital divide and approaches to digital inclusion

Examples of digital divide	Examples of digital inclusion
Still growing gap between developed and developing countries concerning physical access to the Internet[113]	Nigeria/Senegal/Tanzania: access to, and use of, digital technology to improve labour force participation, thus reducing poverty[114]
Magelang: large proportion of urban poor unable to execute basic tasks on their phones[115]	Johannesburg: short training sessions close to public Wi-Fi points[116]
Indian informal settlements: women less likely to own mobile phones, have Internet access and digital skills than men[117]	Cities Coalition for Digital Rights: a coalition of 45 cities around the world committing to the provision of affordable Internet and improvement of digital literacy of urban dwellers[118]
Santiago and Medellín: sparse Internet access even if households could afford it[119]	Chattanooga, US: citywide Internet coverage provided by the municipality[120]

In terms of the measures to improve digital inclusion, a World Bank study covering Nigeria, Senegal and Tanzania showed that both Internet availability and the use of more sophisticated digital technologies led to more and better jobs for lower-income, lower-skilled people.[121] Labour force participation and wage employment increased significantly after three years in areas where Internet access had been introduced. The importance of skills training was recognized in a smart city project in Johannesburg: in addition to rolling out free Wi-Fi access points near public hospitals, libraries and along public transport routes across the city, 85 trained Jozi Digital Ambassadors were deployed over a three-month period to train and enroll residents in Internet use.

In North America, several cities have sought to overcome the digital divide.[122] For instance, in Chattanooga, US, the city took the lead in installing a citywide fiber network through its own municipal electricity utility company, thus providing affordable gigabit speed to previously underserved communities. During COVID-19, low-income students were granted free Internet access to enable them to participate in online learning. The initiative also helped the city attract new investment, with many tech companies choosing to locate there. Box 9.3 shows how the Toronto is bridging the digital divide, which creates significant barriers for the most vulnerable and marginalized residents in accessing vital services and supports.[123] Apart from these examples, urban actors seeking to access knowledge and guidance on how to facilitate digital inclusion may find the declaration of the Cities Coalition for Digital Rights, agreed between 45 cities, a useful resource.[124]

Box 9.3: Bridging the digital divide in Toronto

All of Toronto has access to some form of Internet coverage, yet not everyone is able to afford quality access due to high prices. As of 2020, 39 per cent of the city's residents did not have Internet speeds that met the standards of the Canadian Radio-television and Telecommunications Commission. This was due to either poor infrastructure or inability to afford quality service. Over one-third of Toronto households indicated that they were able to afford high-quality Internet only at the expense of other purchases like food or clothing. Canada has among the most expensive Internet costs globally; even high-income households tend to spend at least 9 per cent of their income on expenses related to Internet connectivity. Over half of the people surveyed by the Toronto Public Library indicated that the public library was the only source of Internet access.

This digital divide creates significant barriers for Toronto's most vulnerable and marginalized residents in accessing vital services and supports. Residents without consistent internet access cannot access information, resources, supports, educational tools and social platforms to stay connected. Businesses trying to compete in a digital-first world are set back by insufficient Internet access and are unable to have staff effectively work from home.

To address the digital divide and Internet affordability issue, the Toronto undertook several pilot projects:

- 25 residential tower apartments were planned to be connected to free Internet for a year, covering 13,000 residents
- Public Wi-Fi in shelter sites
- Distribution of 400 connectivity kits that include a laptop and an Internet receiver
- Donation of 5000 smartphones to indigenous populations, each with six months of free data and calls
- Free Wi-Fi access expanded in parks and recreational areas

In early 2021, the government concluded that the measures taken were effective, but hardly scalable and not economically sustainable. A more ambitious programme, ConnectTO, was therefore initiated as a city-driven collaborative programme that aims to leverage the use of municipal resources and assets to help bridge the increasing digital divide by expanding access to affordable, high-speed Internet to underserved Toronto residents.

ConnectTO also aims to streamline and update existing city processes to ensure Internet connectivity planning, such as installing public Wi-Fi and laying fibre conduits in existing construction work, is embedded in the planning and execution of various city initiatives moving forward. ConnectTO recommends a phased delivery to effectively build the proper foundation for citywide deployment.

Access to reliable and affordable internet improves socioeconomic opportunities and access to city services for equity-seeking groups and vulnerable populations, nurtures innovation, stimulates Toronto's economic recovery and growth by enabling the digital economy, supports the city's long-term fiscal health by creating valuable city assets, and contributes long-term benefits related to the COVID-19 recovery plan.

Source: UN Habitat, 2021e.; City of Toronto, 2021.

9.4.2. Avoiding eco-gentrification

Eco-gentrification is the process by which urban greening raises property values and drives out existing residents. Like the digital divide, the environmental divide can be considered in terms of the three criteria of access, skills, and outcomes: which urban population groups in which cities have access to environmental technological solutions; whether they have the requisite skills to make use of these; and whether the outcomes such as reduced air pollution, low-carbon infrastructure benefit them equally.

Cities' efforts to mitigate and adapt to climate change can exacerbate processes of exclusion: the climate privileged benefit from low-carbon investments, green infrastructure and amenities; whereas for the climate precariat, climate action may result in rising housing and living costs.[125] Thus, urban climate policies may produce a distinct form of gentrification, with middle- and upper-income residents making choices that afford them access to low-carbon infrastructure and favourable mixed-use neighborhoods.[126] Similar dynamics will be at work between cities, with some disadvantaged by a lack of resources to deploy environmental technologies, and others able to address the climate crisis by using environmental innovation to render their cities more prosperous and livable places. A further problematic dynamic between cities across global regions arises from the shipment of technological waste to far-away places. A case in point is Agboloshie in Accra, one of the world's largest sites of electronic waste dumping, including a growing number of electric vehicle batteries.[127] Low-income residents in that area bear the toxic burden of the low-carbon transition accelerating elsewhere.

Urban actors need to be aware of the convergence of green and smart technological innovations, and how this potentially multiplies technological divides. A study of the social effects of eco-innovation in smart city projects in the city region of Milan shows that certain social groups were not only disadvantaged due to the eco-gentrification effect, but were also excluded due to a lack of digital literacy.[128]

The primary motive for addressing digital, environmental and other divides caused by technological urbanism is evidently to prevent new inequalities from arising and existing ones being further exacerbated. Beyond this, the effort to bridge these divides should yield wider economic, social, and environmental benefits. Enabling digital technology positively enhances labour force participation and, thus, reduces poverty.[129]

9.5. Technological Tools for Inclusive Governance

In a World Bank report on citizen-driven innovation in cities, the term Government 2.0 denotes an advanced mode of municipal government where citizens, developers, city administrations and other actors form partnerships to deliver improved, transparent public services.[130] This thinking reflects a growing trend in policy and practice that emphasizes the benefits of involving citizens and stakeholders in local government. ICT and digital technologies are considered important enablers of more inclusive policy- and decision-making. Consequently, many cities have put in place various e-government initiatives. While some follow a more conventional approach consisting of one-way communication to service users, others pursue more interactive, multi-stakeholder engagement as part of a drive towards participatory e-governance (Chapter 8). Significantly, ICT and digital tools are also increasingly used to create opportunities for public participation beyond municipal government: civic engagement, e-government and newer concepts like "community technology making."

Technology, however, is no panacea: the potential of technology-enabled participation depends on the suitability of technological tools and techniques in particular contexts. Furthermore, public engagement initiatives risk being empty exercises, unless they are properly related to policy and decision processes, and are supported with relevant skills training to allow participants to engage properly.

The potential of technology-enabled participation depends on the suitability of technological tools and techniques in particular contexts

9.5.1. Beyond the basics of e-government

E-government is typically considered at the national level, but its relevance is felt at the municipal level.[131] People often have a invested interest in what happens in their local communities, and local governments deal directly with issues affecting residents' daily lives. Findings from a global survey of 100 cities found that fewer than half had advanced e-government practices, such as deliberative forums, consultations and polls. Instead, most portals heavily relied on social media networks, such as YouTube, Facebook and Twitter.[132] Cities need to embrace a more comprehensive e-government vision and strategy, coupled with sufficient financial investment. A commitment to

Figure 9.5: City dashboard Bandung, Indonesia

Source: City of Bandung, 2022.

the use of open data, and attention to data quality and interoperability, are necessary stepping stones to realizing broader collaboration.[133]

City dashboards showcase the potential of ICT to increase transparency in municipalities. As city administrations gather and process increasing amounts of diverse data on urban environmental and socioeconomic indicators, dashboards help to visualize and organize these data in accessible fashion.[134] Types of data presented include census data, data collected through citizens' mobile phones, and sensor-based measurements of noise or pollution, as exemplified by the city dashboard in Bandung, Indonesia (figure 9.5).[135] Yet, in order to ensure the usefulness of such visualization tools, digital and data literacy of residents needs to be promoted.[136]

There are numerous examples of cities deploying ICT and digital technologies creatively to enable residents and stakeholders to become actively engaged. For instance, the city government of Jakarta introduced QlueMyCity, a map-based integrated reporting and monitoring platform which utilizes citizen participation to identify problems across the city: citizens may report faulty streetlights, clogged drains, waste disposal issues and other infrastructure in need of repair (figure 9.6).[137] The mobile app subsequently displays information on how the problem was resolved, and allows for further feedback.

In the US, a study of public engagement platforms used by local governments identified several approaches to including residents, such as consulting them on proposed decision options, inviting them to make suggestions, and involving them directly in decision-making.[138] Examples include: IdeaScale (Atlanta), which lets participants submit ideas, comment as well as vote on them; and BudgetAllocator (Bayswater), used for participatory budgeting. The study also highlighted the interrelationship between these online platforms and offline consultation and engagement processes used by local governments. Communities that experiment with participatory digital platforms are typically ones that have a pre-existing commitment to, and a track-record of, citizen engagement. Mexico City is further example of the innovative use of technology to realize participatory e-government.[139]

9.5.2. Giving voice through civic engagement

Technology-based methods are also used for engagement activities within communities. One such approach is citizen science, which encourages ordinary people (non-experts) to participate in community-based research on relevant issues. The benefits are twofold: first, tapping into local knowledge, which can inform research and policy by contributing new insights; and second, strengthening the capabilities of individuals and communities. A practical example of citizen science, and the supportive role played by digital technology, stems from the city of Eskilstuna, Sweden (Box 9.4).

Figure 9.6: Screenshots from the QlueMyCity app, which utilizes citizen participation to identify problems across the city

Source: Civic Tech Field Guide, 2021.

Box 9.4: Marginalized youth as citizen scientists in Eskilstuna, Sweden

Eskilstuna is a mid-sized Swedish city home to several neighbourhoods where a majority of residents are foreign-born or have foreign backgrounds as refugees from wartorn countries like Somalia and Syria. In ethnically homogenous Sweden, these communities have struggled to integrate and their youth population have higher rates of criminal activity, including gang affiliation and drug trafficking, that have led these neighbourhoods to be stigmatized in the popular imagination. Researchers enlisted young men in two deprived neighborhoods to serve as citizens scientists, who would use a smartphone app to collect data about their neighbourhood and its residents. The aim was to engage young people to produce local knowledge about the experience and everyday challenges of living in marginalized communities. The rationale was that, as citizen scientists, the participating young people could generate unique knowledge by capturing their surroundings through pictures on their mobile phones and commenting on the significance of certain sites for their neighborhoods, knowledge that external researchers may otherwise not easily access. In turn, this could help overcome the gap between the external perceptions of these neighborhoods and the on-the-ground, lived experience of young people. Insights from this citizen science project were presented to residents and politicians from Eskilstuna's municipality at a public event.

Source: Fell et al, 2021

Citizen science projects are increasingly being used in the implementation and monitoring of the SDGs at the local level. Since the SDG indicators are officially reported at the national level, and municipal governments often do not have the required data to assess progress in achieving the SDGs, citizen science can offer a useful tool for producing localized data. A study of 139 citizen science projects on SDGs in developing countries noted that a strength of the approach is the ability to generate data using a wide range of methods in locations that are inaccessible with other methods.[140] Another strength was the opportunity to involve marginalized and hard-to-reach groups, thereby increasing their representation in datasets. However, there are several challenges, especially in the context of developing countries, such as low literacy levels; language barriers between organizers and participants; insufficient organizational capacity to run citizen science projects effectively; and poor infrastructure to support civic engagement.

Digital tools can enable inclusion and community-building among elderly population groups who often miss out on the benefits of digitalization. One example is the organization of

Digital tools can enable inclusion and community-building among elderly population groups who often miss out on the benefits of digitalization

digital games in Vancouver, where the participation of older citizens in a citywide virtual bowling tournament allowed them to partake in activities which they would otherwise not be able to join. Crucially, the digital game helped them build new social relations that continued after the tournament.[141] Another example of digitally-enabled civic engagement can be found in Berlin, where the grassroots GoVolunteer app facilitates participation in civic and social projects by listing over 1,800 volunteering opportunities.[142]

9.5.3. Community technology making

Public participation can also take the form of "community technology making," which involves residents creating their own digital or technological solutions to urban challenges. This concept covers a range of formats, including hackerspaces, makerlabs, hardware incubators and fixer collectives, all of which have in common the aspiration that better urban technologies and environments can be built by their users.[143] One example is Richmond MakerLabs in London, which describes itself as an inclusive "community workshop," and offers access to various technologies, including electronics, 3D printing and laser cutting.[144] "Urban living lab" is an umbrella term used for projects that seek to involve citizens in creating tools and applications. A review of urban living labs in four European cities identified several ways in which participating citizens got involved, including measuring local environmental data, testing smart products and developing technological devices to improve local services.[145] The European Network of Living Labs is the largest partnership of such urban labs and has extend its network globally (see figure 9.7). The study, however, identified as a relative weakness the exclusion of the participants from the wider governance of the smart city initiatives with which the living labs are associated.

A study of civic hackathons in European cities found that, unlike conventional hackathons which mainly cater to high-skilled software developers, these civic versions tend to include a demographically and socially more diverse set of local participants.[146] The main purpose of the hackathons studied was to involve citizens in analysing open data as a basis for informing how their neighbourhoods could be improved.

The question of who gets involved not just in hackathons, but also in other forms of shared technology making is critical, since too often they tend to attract predominantly male participants with pre-existing technical knowledge.[147] In response, some organizers actively seek to include a diverse range of participants, thereby promoting a greater equality of gender, race and class. This also opens up opportunities for alternative visions for, and approaches to, technology making in and hacking of the smart city.

Figure 9.7: Living Labs that are part of the European Network of living labs

Source: Battistoni et al, 2022.

9.6. Towards Responsible Innovation

The preceding sections demonstrate that innovation and technology harbour risks as well as benefits for cities. Frontier technologies often raise complex ethical, legal and planning issues. Automation is a case in point: while connected-and-autonomous vehicles (CAVs) promise to bring benefits to consumers and society at large, there are several technical, ethical, and legal barriers to their adoption in cities.[148] This includes legal challenges and ethical controversy concerning CAVs' independent decision-making on the distribution of harm between passengers and other road users, like pedestrians and cyclists, in the event of traffic accidents. A separate concern is the potential of mass surveillance arising from the technical necessity of continuous location tracking of CAVs. Another example is public unease caused by robots deployed to patrol anti-social behaviour, such as smoking in an unauthorized area or incorrect parking of bicycles, as recently illustrated in Singapore.[149] As discussed earlier, there are concerns that the automation of jobs will lead to a rise in urban unemployment and, consequently, exacerbate inequalities and strain social cohesion.

Cities, therefore, need to anticipate systemic changes and major impacts resulting from technological innovations and, importantly, be proactive about assessing and managing them. This should include addressing environmental externalities, such as resource depletion and habitat loss,

Electric vehicle Charging stations, New Delhi, India © Shutterstock

A responsible innovation approach should involve a wide range of urban stakeholders, including citizens, who can provide essential local knowledge and practice perspectives

as well as carefully considering negative socioeconomic impacts of new technology. To this end, "responsible innovation" offers a promising approach to engage a wide range of stakeholders in assessing the ethical acceptability and societal desirability of technological developments.[150] Responsible innovation has been defined in relation to cities as "a collective commitment of care for the urban futures through responsive stewardship of science, technology and innovation in the present."[151]

Responsible innovation goes beyond technology assessment focused on determining quantifiable risks and social impacts; it equally pays close attention to ethical questions and issues of moral ambiguity.[152] It also pays heed to the possibility of unintended consequences arising from digital technology developed for one purpose subsequently being used for other purposes (for example, if drones designed to monitor traffic were used to track individuals).[153] Consequently, a responsible innovation approach should involve a wide range of urban stakeholders, including citizens, who can provide essential local knowledge and practice perspectives. Such an approach should, therefore, also create spaces for the public scrutiny of the consequences of technological innovations.[154] An example of a collaborative approach to shape the future of urban technology is Flying High, which focused on drones in cities (Box 9.5).

Urban actors can now consult several frameworks for responsible innovation. The Montréal Declaration for Responsible Innovation of Artificial Intelligence, launched in 2018, provides urban actors with a set of underlying ethical principles and practical guidelines for accomplishing digital transitions.[155] Cities could also adopt a "technological sovereignty" approach as used by Barcelona in its Digital City Plan. Based on three principles—the use of free software; the interoperability of systems; and the use of open standards—Barcelona has attempted to lessen the dependence on global technology companies in its provision of digital services.[156] Importantly, responsible innovation raises essential questions about the social and environmental risks of urban frontier technologies and, conversely, how innovation and technology can be deployed inclusively and sustainably.

Box 9.5: Collaborative assessment of future drone technology in the UK

Flying High is an initiative run by the UK's National Endowment for Science, Technology and the Arts since 2017. It brought together city leaders, regulators, public services, businesses and industry in a dialogical process of exploring systemic requirements for integrating drones in cities. Five cities and metropolitan regions—Bradford, London, Preston, Southampton and West Midlands—were engaged to situate the technology assessment within real-world contexts. Among participants, there was strong support for future drone use where this provided clear social benefits, such as medical deliveries, support for fire and rescue services, and the monitoring of traffic incidents. Support for commercial uses, such as parcel delivery, was more muted.

The benefits were set against several significant concerns around safety, security and privacy, with agreement that an appropriate regulatory environment would need to be established to allow autonomous flight in large numbers and over long distances. Furthermore, regulation should be undergirded by a shared societal vision of what is, or is not, acceptable, for example relating to noise pollution, safety and commercialization. Tellingly, the assessment revealed that technology developers and regulators had not previously considered involving cities in the discussion, even though the application of drones is anticipated to be concentrated in urban areas and as flight in low-altitude airspace directly impacts urban environments.

Source: Nesta, 2018.

9.6.1. Mitigating digital risks

Cities need to consider distinct risks that may arise from digital transformations, like security vulnerabilities in smart city technologies.[157] Beyond technological threats, social and ethical challenges require careful consideration. One major concern is that fundamental human rights may be at stake as human activity is increasingly subjected to hyperconnectivity, datafication and algorithmization.[158] Threats to human rights can arise from digital surveillance, the power of dominant digital platforms and the increasing use of AI in decision processes. In response, the notion of "digital rights" has gained traction, in an effort to integrate the smart city and its technologies with ethical principles.[159] Four risks of digitalization are highlighted in Table 9.2, alongside examples of cities' responses.

Table 9.2: Four risks of digitalization, and examples of mitigation measures

Risks	Mitigation measures
Erosion of privacy: As highlighted by the United Nations Human Rights Council, digital innovations risk eroding privacy and related freedoms, including free movement and speech[160].	Hamburg data strategy mandates the anonymization and aggregation of data to ensure the protection of sensitive personal data.[161]
Biases of automated and AI-enabled processes: Software developed by tech firms has been found to discriminate against people of colour, ethnic groups, or religious minorities.[162]	Helsinki has begun to compile its own datasets for training AI-enabled services to avoid reliance on global software developers unfamiliar with the city's demographic composition.[163]
Threat of exclusion: Increasing reliance on algorithms can exclude citizens from decision-making processes, while digital and environmental divides can exclude urban dwellers from the benefits of innovation.	Medellin's smart city initiative Medellín Ciudad Inteligente complements Wi-Fi rollout in public parks and schools with digital literacy training for 10,000 residents per year, prioritizing those living in deprived neighbourhoods.[164]
Data misuse: Data can get processed and analyzed for other purposes than originally intended, such as facial and number plate recognition software used to surveil citizens' movements.	Portland defines and justifies clear targets that data collection shall support and collects only the minimum quantity of data necessary to fulfil those purposes.[165]

The four risks of digitalization may be heightened in developing countries and cities for three related reasons. First, automated and digital solutions designed in developed countries can exacerbate the risks of discrimination, bias and surveillance when the technology is applied in cities in developing countries. [166]Second, low- and middle-income countries may not have the necessary resources and institutions to redress inequalities arising from digital transformations, and to protect marginalized people's rights. Third, due to a comparably weak research and development base and limited resource capacities, they risk becoming technologically dependent on corporations from the Global North.[167] In order to understand the repercussions of digital innovations in cities in emerging economies, digital ethicists have suggested that bespoke impact assessments be carried out where technology developed in the Global North is to be deployed in the Global South.[168] Another recommendation is to trial new tools and processes first in specified districts in emerging cities, before scaling them up to the citywide level.[169]

9.6.2. Addressing environmental risks

The case for low-carbon technologies is by now well-established: they are essential for clean energy generation and for the decarbonization of urban infrastructure systems, such as transportation (Chapter 5). Yet, their associated environmental externalities, as well as potential health risks, should not be overlooked. In encouraging the adoption of low-carbon technologies, urban actors need to be aware of negative impacts and consider how to mitigate these. Several key risks are highlighted below, while Box 9.6 discusses innovative mitigation measures from the circular economy in both high- and low-tech contexts.

- Reliance on critical raw materials: According to the United Nations Environmental Programme's International Resource Panel, an estimated 600 metric tons of metal resources will be needed by 2050 to meet the demands of additional infrastructure and wiring.[170]

- Generation of toxic waste: Arises from both the production of low-carbon technologies such as semiconductors for photovoltaic solar panels, wind turbines and end-of-life decommissioning.[171] Toxic waste management disproportionally affects citizens' health in developing countries.[172]

- Adverse impacts on biodiversity: The electrification of transportation and the rollout of CAVs require new types of infrastructure, such as charging stations and vehicle depots, with the likely loss of habitat and increased urban sprawl.[173] Electrification should rely on electricity from clean sources.[174]

- Energy consumption of smart technology: There is a heightened risk of a rebound effect for ICTs, whereby energy-saving gains are cancelled out by growing consumption patterns.[175] For instance, the annual energy consumption of Bitcoin cryptocurrency is higher than that of Ireland, accounting for 0.5 per cent of global electricity demand in 2018. [176]

Box 9.6: Mitigation measures for environmental risks.

The circular economy offers a possible framework to address some of above-mentioned environmental risks by ensuring the responsible use of resources in cities and promoting sustainable innovation.[177] An example is the Park 20/20 office complex in Amsterdam, where, following the cradle-to-cradle concept, construction materials and green technology can be dismantled and fully repurposed at the end of a building's lifespan.[178] Elsewhere, the Togolese innovation laboratory WoeLab launched the HubCité project in the capital, Lomé, to demonstrate that the circular economy is neither confined to global cities nor contingent on large financial investments. By providing technological equipment and training through two innovation spaces, WoeLab encourages residents to create collaborative hyper-local urban projects and find low-tech solutions to challenges, including waste management and recycling, in their neighbourhoods.[179]

In order to ensure that innovation and technological development are not pursued just for their own sake, but rather in a socially responsible manner to enable sustainable urban development, a key question to ask is to what extent do urban technological innovations result in better outcomes for residents and the environment? Moreover, technology assessment should consider the distribution of benefits and costs to determine whether certain social groups and certain places benefit more, while others bear disproportionate risks.[180] This analysis matters for relations both within cities as well as between cities if the goal of urban technology is to engender equitable and just development.

9.7. Concluding Remarks and Lessons for Policy

The acceleration and convergence of various green and smart technological innovations are being widely witnessed in contemporary urban planning and development and are set to be a dominant force determining our urban futures. City governments and other urban stakeholders have an active role to play in deciding how innovation and technology are adapted in ways that suit specific urban contexts and benefit sustainable development. There are significant opportunities for localized approaches, given the trend towards flexible and modular technological innovations, as exemplified by micro-grid renewable energy systems and community digital platforms. At the same time, cities need to address systemic threats, such as the prospect of rising socioeconomic inequalities caused by automation and digitalization. Altogether, this highlights the need for ongoing social and institutional innovation to accompany technological developments, including investment in skills training and support for community partnerships.

The evidence presented in this chapter prompts seven key lessons for sustainable urban futures. These point to an overarching commitment to the inclusive deployment of technology for the well-being of citizens and the environment and emphasize the agency of cities as hosts, initiators and implementors of innovation and technology.

- City governments should utilize their convening power to foster a thriving innovation ecosystem and support locally embedded socio-technical development. This can be achieved with territorial planning, fiscal incentives and other measures to support the co-location of research organizations, start-ups, industry and social enterprises. Innovation should also be encouraged in the informal sector, mainly in developing countries, by recognizing and supporting informal entrepreneurs within the community.

- Cities embedded within wider regional and national innovation systems, can act as innovators and implement technology to steer sustainable urban development. This relates to both the delivery of public services and the development and management of various urban infrastructures. The example of the Rogland region in Norway, where 11 municipalities jointly developed an integrated LED street and park lighting system using their own industrial company, illustrates cities' role as innovators. It also demonstrates the benefits of cooperation and knowledge exchange among cities.

- The likelihood of new inequalities arising from technological developments, and existing ones becoming more entrenched, requires careful attention and active intervention. There is strong evidence of digital marginalization disproportionally affecting poor people, the undereducated, women and older persons, especially, though not exclusively in developing countries. Digital labour platforms, while offering accessible and flexible work, may expose workers to precarious conditions without some regulatory safety nets. Inequalities can also arise if environmental technologies unevenly benefit certain groups of residents and neighborhoods. Conversely, some urban communities are at greater risk of environmental harm caused by technology.

- Skills development and training have emerged as critical areas of action. This issue partly relates to the workforce in some formal sectors, where digitalization and especially automation are on course to make a growing number of tasks undertaken by humans redundant. Here, the example of Singapore demonstrates the opportunity for retraining and upskilling to allow workers to shift to jobs not at risk of automation. It also relates to the informal economy, where the provision of basic skills training and digital literacy are essential to enable people to use mobile Internet and microwork platforms. The deployment of digital ambassadors or technology mediators can prove useful to achieve strong community participation. Beyond work, digital skills training is essential to allow otherwise disenfranchised groups to benefit from digital services, such as telehealth care.

- Connected and digital technologies offer city governments a range of opportunities to improve openness and actively engage with residents. The evidence shows that e-government is too often used merely for one-way communication, though there are flourishing examples of cites using technology more innovatively, for example with interactive apps and online platforms that allow active citizen participation. Beyond city administrations, technology can be used to strengthen civic engagement and community technology making.

- Cities need to take into account negative environmental externalities when investing in various low carbon and ICT technologies. There is a significant risk of a rebound effect, whereby energy savings achieved by connected and digital technologies are cancelled out by increasing consumption. Additionally, there is particular concern about the energy intensive nature of blockchain

technology, which is seen by many as integral to the next generation of smart cities.

- Finally, given the need to weigh benefits and risks of new technology, cities should commit to undertake a robust technology assessment relating to ethical, legal, social and environmental aspects. The example of aerial drones demonstrates both the complexities of issues raised and the importance of cities' involvement in assessing and regulating technological innovations.

Endnotes

1. IRP, 2017.
2. Li et al, 2019; Zhang et al, 2019.
3. OECD, 2019
4. OECD, 2019
5. UN Habitat, 2020g.
6. OECD, 2019c.
7. Rosenthal et al, 2020.
8. JPI Urban Europe, 2022
9. OECD, 2020d.
10. Schraven et al, 2021
11. Allied Market Research, 2018
12. Joss et al, 2019
13. Yigitcanlar et al, 2021
14. ISO, 2020.
15. City of Amsterdam, 2022
16. City of Melbourne, 2022
17. Tironi et al, in: Karvonen et al, 2019
18. Shelton et al, 2015
19. Karvonen et al, 2019; Aurigi et al, 2021.
20. Jiang et al, 2020; Kitchin et al, 2017
21. UN-Habitat, 2021g.; Trencher, 2019.
22. Cardullo et al, 2019; Cardullo et al (eds.), 2019; Willis, 2019
23. Burns et al, 2021.
24. Martin et al, 2018.
25. Yigitcanlar et al, 2020.
26. Evans et al, 2019
27. Van Noordt et al, 2019; Ryan et al, 2019; Curran et al, 2021
28. WEF, 2021b; Krishnan et al, 2021.
29. Kumar et al, 2020.
30. Designing Buildings, 2020.
31. BloombergNEF, 2021.
32. Yamagata et al (eds.), 2020.
33. IRENA, 2020.
34. Department for Transport, 2019.
35. IEA, 2021a.
36. Roland Berger, 2021.
37. Fortune Business Insights, 2021.
38. Infiniti Research Limited, 2021.
39. Ryan et al, 2019.
40. Allied Market Research, 2018.
41. UNEP, 2019b.
42. StartUs Insights, 2021
43. McKinsey, 2021
44. EEA, 2021
45. World Bank,2018c.
46. World Bank, 2018c.
47. Viola, 2020.
48. Hoffmann et al, 2020
49. WHO, 2018c.
50. Fonseca and Whitney, 2021.
51. EDF, 2021
52. Department for Transport, 2019
53. IEA, 2021b
54. UNEP, 2021a; UNEP, 2021b
55. Fonseca and Whitney, 2021.
56. Fonseca and Whitney, 2021.
57. Wood et al, 2019
58. GIZ, 2020a
59. Tucker et al, 2020.
60. The platform economy is based on online marketplaces where the operators bring together vendors and customers. The platform economy creates new employment opportunities for those who work in the informal economy but it can also mean new dependencies and discrimination (GIZ, 2020b)
61. G20, 2018.
62. Kwami, 2015.
63. Keskinen et al, 2021.
64. Sadowski, 2020.
65. Barns, 2020; Rodgers and Moore, 2018; Repette et al, 2021.
66. Reuters, 2021; University of Cincinnati Law Review, 2021.
67. Bauriedl et al, 2020; Standing, 2018.
68. Wood et al, 2019.
69. Bates et al, 2019.
70. Bates et al, 2019; ILO, 2019.
71. World Bank, 2016.
72. Frey et al, 2017
73. Van Noordt et al, 2019; Ryan et al, 2019.
74. Fernández et al, 2015.
75. World Bank, 2018c.
76. Mira-Bonnardel, 2021; WEF, 2021c.
77. McKinsey Global Institute, 2021.
78. Kunzmann, 2020.
79. ILO, 2019; ILO, 2021b.
80. Lund et al, 2021.
81. Florida et al, 2021.
82. The Guardian, 2021a; UNCTAD, 2021b.
83. IEA, 2021c
84. Rachmawati et al, 2021.
85. Hu et al, 2020.
86. Feichtinger et al, 2021
87. Lund et al, 2021.
88. Frank et al, 2018
89. Hilpert, 2021.
90. Lund et al, 2021.
91. WEF, 2020b.
92. Axios, 2019
93. Government of Singapore, 2021.
94. Business Insider, 2021; West et al, 2021
95. Bellomo et al, 2020.
96. Erachalu et al, 2021.
97. UN Habitat, 2021e.
98. United Nations, 2017.
99. Robin et al, 2021.
100. Van Dijk, 2020.
101. UNCTAD, 2021a
102. ITU, 2018.
103. UN Habitat, 2021e.
104. Ajuntament de Barcelona, 2021.
105. Mulyaningsih et al, 2020.
106. Van Deursen et al, 2018; Van Dijk, 2020.
107. UNCTAD, 2021a
108. UNCTAD, 2021a
109. Mulyaningsih et al, 2020; Joshi et al, 2020.
110. Bakshi et al, 2021.
111. Stark, 2021.
112. Valenzuela-Levi, 2021.
113. Van Dijk, 2020.
114. World Bank, 2021b.
115. Mulyaningsih et al, 2020.
116. Van Rensburg et al, 2019.
117. Joshi et al, 2020
118. Cities Coalition for Digital Rights, 2021
119. Valenzuela-Levi, 2021.
120. Jakimowicz, 2021.
121. World Bank, 2021b
122. Jakimowicz, 2021; City of Chattanooga Office of Economic Development, 2019; NEXTpittsburgh, 2015.
123. City of Toronto, 2021.
124. Cities Coalition for Digital Rights, 2021; UN Habitat, 2020j.
125. Robin et al, 2021.
126. Rice et al, 2019.
127. Sovacool et al, 2020.
128. Beretta, 2018
129. World Bank, 2021b.
130. Eskelinen et al, 2015.
131. UNDESA, 2020a.
132. UNDESA, 2020a
133. De Filippi et al, 2020.
134. Young et al, 2021.
135. Vila et al, 2018.
136. Young et al, 2021.
137. Allen et al, 2020.
138. Cho et al, 2021.
139. Cruz Ruiz, 2021.
140. Pateman et al, 2021.
141. Schell et al, 2017
142. Mos, 2021.
143. Rosner et al, 2014.
144. Richmond MakerLabs, 2022.
145. Nesti, 2020.
146. Jaskiewicz et al, 2020.
147. Perng, 2019.
148. Gill, 2021.
149. Euronews, 2021; The Guardian, 2021b.
150. Nagenborg, 2020.
151. Yigitcanlar et al, 2021 (citing Owen et al, 2013).
152. Van Lente et al, 2017.
153. Whittlestone et al, 2019
154. Calvo, 2020.
155. Université de Montréal, 2018.
156. Foth et al, 2021.
157. Kitchin et al, 2019.
158. Calvo, 2020; Karppinen et al, 2020
159. Calzada et al, 2020
160. UNHRC, 2021.
161. Ryan et al, 2019.
162. Yigitcanlar et al, 2021.
163. Ryan et al, 2019.
164. Irazábal and Jirón, 2020
165. City of Portland, 2021.
166. Arun, 2020
167. GIZ, 2020a.
168. Arun, 2020
169. GIZ, 2020a.
170. IRP, 2017
171. Matatiele et al, 2016.
172. Robin et al, 2021
173. Goddard et al, 2021.
174. IRP, 2017.
175. IRP, 2017; Hedberg et al, 2019.
176. Ghosh et al, 2021.
177. Lakatos et al, 2021
178. Cradle to Cradle Certified, 2017.
179. Agbodjinou, 2020
180. Yigitcanlar et al, 2021.

Chapter 10:

Building Resilience for Sustainable Urban Futures

Policy points

1. Building resilience for sustainable urban futures requires integrated linkage of the various pillars of the global sustainable development agenda.

2. Building urban resilience is a multisectoral, multidimensional, multi-stakeholder process that requires a clear change of trajectory from previous paths.

3. Effective urban resilience capacity building requires mainstreaming across local governments.

4. Governments have a roadmap to urban resilience in the global sustainable development agenda.

5. Cities, subnational governments and other urban actors should urgently prioritize bottom-up approaches when designing urban resilience interventions.

6. Building resilience requires innovative, and sustainable financing instruments beyond the traditional fiscal tools at the disposal of cities and national governments.

7. Integrated urban planning is an essential component and prerequisite for resilient urban futures.

8. Extending social protection to informal sector workers is critical for inclusive development and resilient urban futures.

9. Investing in key urban infrastructure must be a prerequisite for building sustainable and resilient urban futures.

10. Policymakers must match urban risk assessments with appropriate solutions.

11. Visioning and implementation of urban resilience plans must prioritize the poorest and most vulnerable communities.

12. Building urban resilience will not succeed without public participation.

The world's cities find themselves at a crossroads of uncertainty as to which scenario of urban futures awaits them. Will they embark on an optimistic path of more just, green and equitable cities? Will business as usual lead them down a pessimistic path of a widening gap between the urban rich who can adapt to twenty-first century challenges and the urban poor who will suffer? Or will they nosedive into a high damage scenario of catastrophic destruction at the hands of cascading public health emergencies, climate crises and armed conflicts? While many factors influence these pathways, resilience is key to determining urban futures.

Since the World Cities Report 2020 was published in the early days of the COVID-19 pandemic, the world has become a more uncertain place punctuated by localized events with global consequence. No human settlement was left untouched by COVID-19, even with widespread, if unevenly distributed, access to safe and effective vaccines. Although many, but certainly not all, cities find themselves in 2022 figuring out how to live with COVID-19, they are now facing other shocks. Persistent and new armed conflict have acute direct impacts in cities across Afghanistan, Ethiopia, Syria, Ukraine and Yemen. Spikes in food and energy prices, as well as runaway inflation, have created new economic stresses for municipal finances and urban household budgets alike. China's zero-COVID policy has disrupted supply chains in the world's second-largest economy. Meanwhile, the long-term stress of climate change continues to threaten the world's cities as extreme weather events and climate disasters like heatwaves, wildfires, hurricanes and typhoons become more frequent and intense.

The suffering caused by the COVID-19 pandemic has set back economic and social development and undermined some sustainability efforts in the short term. Beyond that, it has exacerbated inequalities and poverty as shown in Chapters 1 and 3. The global rise in inequality since 2020 profoundly underlines the unsustainability of many current lifestyles, consumption patterns and livelihoods and thus the urgency of transitions and transformations to build resilience for more equitable and sustainable urban and societal futures.

The pandemic emerged suddenly and transformed the world dramatically through 2020 and 2021. Although recovery gathered momentum during the first half of 2022, its geographically and socially very uneven complexion, determined in large part by the availability and uptake of vaccines, means that the pandemic's shadow will linger far longer. Indeed, the emergence and rapid global spread of the highly transmissible but fortunately less virulent Omicron variant at the end of 2021 exposed the fragility of recovery and highlighted the highly unequal access to vaccines and people's willingness to accept them. Recent experience demonstrate that other epidemics and pandemics should be anticipated in both emergency and longer-term sustainability and resilience planning.

The effects of COVID-19 have dramatically exposed urban fault lines and highlight that building resilience will require a stronger, more effective multilateral system capable of complementing and reinforcing national and local efforts to put the world firmly on the trajectory of sustainable development. Accordingly, the objectives of this final chapter are to offer clear policy directions for governments and relevant national, regional and local stakeholders in diverse contexts to build resilience, which lies at heart of sustainable urban futures; and to strengthen and integrate the narratives in previous chapters, presenting strong recommendations, especially regarding the complementary roles of national and local governments. The term "urban futures" is used here in recognition of the various potential future scenarios explored in Chapters 1 and 2 but equally importantly, the diverse culturally and locally specific forms that human settlements may take in the future.

In pursuit of these objectives, two key messages are emphasized through this chapter. First, that building resilience for sustainable urban development requires integrated linkage of the various pillars of the global sustainable development agenda. These are the 2030 Agenda for Sustainable Development the New Urban Agenda, Sendai Framework for Disaster Risk Reduction, Addis Ababa Action Agenda and the Paris Agreement on Climate Change. Second, building urban resilience is a multisectoral, multidimensional, multi-stakeholder process that requires a clear change of trajectory from previous paths. This approach entails more than just building back better, if doing so would occur on the same lines that perpetuate inequalities and injustice.

In essence, it is about building back differently. From this mindset, it follows that poverty and inequality are incompatible with sustainability and resilience since they undermine the basis of urban stability and potentially the fabric of society.

The next section examines the concept of resilience in detail, but it is important here to clarify two related terms, vulnerability and adaptation. Both are used in relation to many different hazards, risks, shocks or threats, including climate change, environmental degradation, COVID-19 and other infectious diseases, economic change, political uncertainty and instability, and armed conflict. Vulnerability refers to

an inadequate ability to withstand or resist one or more of these shocks and stresses because of health status, deficient resources, or particular characteristics of an individual, group, location, infrastructure, etc. Adaptation is how individuals or groups respond by changing behaviour, such as making new investments, adjusting building standards, relocating facilities or creating early warning and rapid response systems in order to increase their ability to resist, cope with and otherwise learn to live with the hazard or risk in question.

10.1. Defining, Understanding and Measuring Resilience

Although resilience is key for cities to move toward the optimistic scenario of urban futures laid out in this Report, the term itself deserves consideration. Resilience, like sustainability, has a complex history and is often used imprecisely and with diverse meanings in different communities of practice and contexts, even within the urban arena.[1] This imprecision is unhelpful both analytically and in terms of implementation. Indeed, despite their distinct meanings, sustainability and resilience are often conflated or used interchangeably, including in some documents of the global sustainable development agenda.[2]

10.1.1. Defining resilience

It is noteworthy that, despite mentioning resilience a total of 17 times, the New Urban Agenda does not define the concept, which implies an assumption that its meaning is clear and universally understood. Yet this is certainly not the case since the proliferation of definitions and widespread lack of clarity regarding measurement of resilience "leads to crippling disconnects."[3] Particularly in urban contexts, which are the main focus here, this can be problematic. One difficulty is that some narrow definitions of sustainability focus principally on increased resource efficiency, perhaps even excluding social justice and equity (including intergenerational equity), even though these have been central to sustainability discourse since at least the Brundtland Commission report in 1987.[4] Such narrow uses of sustainability lead to the reduction or elimination of one key dimension of resilience, namely redundancy,[5] which is fundamental to recoverability.

Early formulations of resilience—as reflected in the Global Report on Human Settlements 2011[6]—were framed in terms of the ability to withstand and recover from an external shock and were popularized by the phrase "bouncing back." Following criticism that bouncing back meant restoring the previous status quo, regardless of how unequal and unjust it was, the requirement of progressive changes to reduce poverty, inequity and injustice was added more recently.[7]

An added difficulty is that, like sustainability, resilience is often considered to represent stability or equilibrium. However, that implies rigidity and a lack of flexibility to change and adapt as the environment and other circumstances change. Even dynamic equilibrium implies more flexible stability within certain boundaries, which may be appropriate for natural ecosystems or even farming systems, though even there the evidence shows that the severity of shocks and recovery time are not clearly related.[8] In social sciences and in urban contexts, which are entirely human artifacts, dynamic equilibrium fails adequately to capture the major rethinking and restructuring now required.

It is important, therefore, to define and use these terms clearly and consistently. Accordingly, here urban resilience is framed as coping with and recovering from a shock by "bouncing back differently" to emphasize the need for substantive change in view of the urgency of meeting the various targets of the SDGs by 2030 and attaining net zero emissions by 2050 at the latest. Many relatively simple and low-cost adjustments, such as equipping streetlights with LED bulbs, have already been widely made, so there are often fewer low-hanging fruit left to pick in the transition to urban sustainability and resilience.

As the IPCC[9] and other authoritative recent reports[10] have warned starkly, progress to date has been inadequate. In order to increase the rate and scale of change needed to achieve these objectives, incremental progress is no longer sufficient and more substantive urban transformations are now required.

The rest of this chapter explores this imperative in greater detail, disaggregating the concept into its economic, social, environmental and institutional elements for greater clarity and precision. This builds on the approach refined by UN-Habitat in recent years: "Both the UN-Habitat and the 'just sustainabilities' approaches to urban resilience look beyond the natural environment, and take in other dimensions such as long-term, participatory in-situ slum and infrastructure upgrading, relocation to improved sites, institutional development and building both awareness and local capacity to respond and adapt."[11]

Urban resilience cannot be achieved in isolation from resilience of the wider territories and societies of which urban areas form integral elements. As the COVID-19 pandemic has underlined,

this requires both a holistic perspective on resilience and effective multi-scale collaborations and integration. National border closures affected urban populations, while citywide lockdown measures had impacts on national economies. In areas like food systems, reliable regional logistics were essential to maintaining food supplies during the crisis.[12]

In these respects, it is also pertinent to reiterate the key messages from the World Cities Report 2020, which highlighted in detail the various dimensions of the value of sustainable urbanization, the urgency of tackling climate change, and the importance of using the New Urban Agenda and Sustainable Development Goals—especially Goal 11 on sustainable urban areas and communities—as accelerators.[13] As the recent IPCC and other reports cited above indicate authoritatively, the urgency has only increased over the last two years, with the continuing ravages of COVID-19 in urban areas underscoring the structural vulnerabilities and need to build resilience:

The pandemic has also put cities to the test, revealing that even apparently affluent and highly developed urban centres are only as resilient as their most vulnerable areas and communities. Furthermore, COVID-19 has highlighted the urgent need for inclusive access to services and amenities for all urban dwellers: all too often, the current emergency has only made more visible the profound inequalities in health, housing and income that divided many cities long before the pandemic began.[14]

Upscaling ambition to move from incremental urban transitions to substantive urban transformations—and to bridge the gap between bold city visions and coherent programmes of actions to achieve the objectives[15]—is therefore essential in order to achieve the optimistic scenario of urban futures. In practical terms, however, it is essential to understand, measure and operationalize urban resilience gaps and strategies in relation to the relevant administrative boundaries. These are usually the individual local government unit, although in large cities this is likely to be the strategic citywide or metropolitan authority. Increasingly, however, it is recognized that planning should be multi-scalar and include the scale of the city region, embracing the surrounding peri-urban and rural areas comprising the functional region integral to the city for food, resources, waste disposal, travel to work and the like. To be effective at this scale requires multilevel governance, both horizontally among local government units but also vertically, between national, regional and local levels.[16]

10.1.2. Measuring resilience

Various initiatives have sought to provide comprehensive approaches to resilience planning through integrated and territorial programming and scorecard methodologies. These include the City Resilience Program, a partnership between the World Bank and Global Facility for Disaster Reduction and Recovery, launched in 2017 to "catalyse a shift toward longer term, more comprehensive multidisciplinary packages of technical and financial services, building the pipeline for viable projects at the city level that, in turn, build resilience."[17] There is also the proprietary Plan Integration of Resilience Scorecard, which has recently been applied comparatively to two contrasting modest-sized cities in the US.[18]

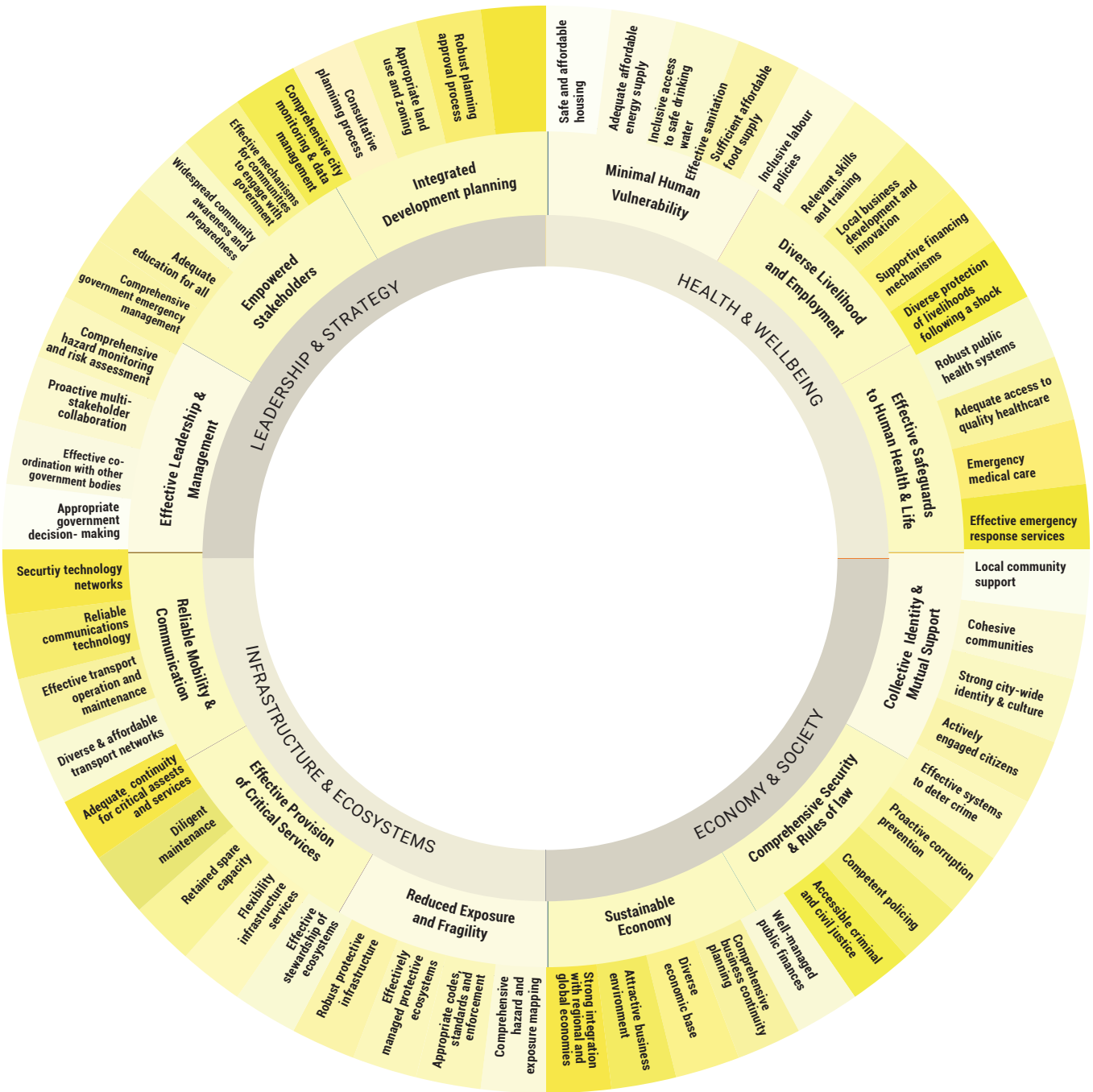
Arguably the most sophisticated, relevant and widely deployed measurement schema to date is the City Resilience Index (CRI) developed by Arup for the Rockefeller Foundation's 100 Resilient Cities programme (which disbanded in 2019) as a tool for measuring implementation of the City Resilience Framework (Box 10.1).[19] Given the index's comprehensiveness, all the themes in this Report are represented by a dimension or goal in local combinations, and it is to more detailed consideration of the economic dimension that this chapter now turns.

Box 10.1: The City Resilience Index (CRI)

The CRI was intended for all member cities to adopt and implement as a tool for measuring progress towards overall resilience over time. Represented by a circle, the CRI comprises four dimensions: health and well-being; economy and society; infrastructure and ecosystems; and leadership and strategy. Each of these, in turn, has 12 goals subdivided into a total of 52 indicators designed to capture the many complementary elements of resilience (Figure 10.1). The four dimensions correspond well to the components of resilience examined in the successive sections of this chapter.[20] The extent to which the CRI had been implemented by the time of the programme's end in mid-2019 varies, but some examples are given in later sections of this chapter.[21] A key part of the process has been aligning local strategies with locally relevant elements of the global sustainable development agenda, especially the SDGs, although only a proportion have so far done this explicitly.[22]

The same assessment found that the 100 Resilient Cities tools over-represent disaster-related issues relative to social themes but that the tools were useful in helping to identify local priorities and capacity building needs: "In doing so, they highlight the importance of planning and capacity and the role of resources, data, and technology that comes with building urban resilience—all crucial for achieving any of the global goals."[23] These issues are addressed in later sections of this chapter.

Figure 10.1: The Rockefeller-Arup City Resilience Index



Source: Rockefeller Foundation and Arup. 2018.

306

10.2. Economic Resilience

Urban economic resilience refers to the ability of a city's economy to withstand and recover from turbulence and shocks (Chapter 4). However, in view of the foregoing discussion in Section 10.1, it is essential not just to focus on economic activity as such, but to incorporate poverty reduction and more equitable distribution of economic opportunities and rewards as key characteristics. Only by so doing can the socio-spatial disadvantages and constraints facing the poorest and weakest residents be tackled. In other words, economic justice is an essential component of economic resilience. Similarly, the multidimensional nature of poverty and inequality, as examined in Chapter 3, means that these also constitute social and environmental challenges that are dealt with in the respective sections below.

10.2.1. Diversification, repositioning and strengthening of the urban economy

An optimistic version of the post-pandemic[24] and climate-resilient era, which this Report seeks to assist local governments in achieving, requires a different structure and balance of urban economic activities, driven increasingly by renewable energy, circular economic activity and green employment. Chapter 4 notes that the need for economic diversification and structural transformation has never been more urgent because of the multiple crises confronting cities. Economic diversification and structural transformation safeguard urban economies against future shocks and provide a more stable and progressive path toward inclusive growth. The pandemic underscored the risks of depending solely on a single driver such as tourism or mining, since any economic downturn could have catastrophic and lasting impacts on the urban economy. As we move into the future, cities should pursue policy measures that enable economic diversification, such as smart urban regulations, strategic investment incentives, green infrastructure development, skills training, innovation districts, and enterprise support and finance, particularly for small and medium-size enterprises —which are the engine of most economies. Collectively, these measures create competitive and vibrant cities that can turn around the economic fortunes of urban areas and more easily adapt to unanticipated changing dynamics.

Economic diversification requires urban leaders who are forward-looking and strategic in formulating policies that strengthen urban economic resilience and prioritize building of productive urban futures that work for all. The COVID-19 pandemic is a wake-up call for both cities and subnational governments on the importance of developing economies

The pandemic underscored the risks of depending solely on a single driver such as tourism or mining

that can withstand and recover from multiple crises while at the same time moving towards equitable and inclusive growth. In cities that are experiencing urban shrinkage, economic diversification should be accompanied by proactive broader economic policies and programmes, with targeted economic restructuring that is aimed at strengthening the competitiveness of new and emerging sectors (most notably knowledge-based industries) in line with the current and future economic realities. As the world moves towards the 2030 deadline to achieve the SDGs, policymakers at all levels cannot afford to remain indifferent to the fragility and vulnerability of urban economies to unanticipated shocks and crises, which can potentially reverse development gains accrued over the years.

Economic diversification requires urban leaders who are forward-looking and strategic in formulating policies that strengthen urban economic resilience

Earlier concerns that economic greening would cause large-scale job losses and impose a heavy economic price have now been allayed by the growing evidence that such losses are more than compensated for by the increasingly diverse productive and commercial opportunities required to enable the green transition.[25] Although some declining or "sunset" industries continue to resist change, the majority are switching production increasingly into green, recyclable and renewable commodities and energy systems through a mixture of fiscal measures and straightforward profitable opportunities as the scale and rate of the green shift accelerate (see below and Chapter 5).

Additionally, increasing net employment, which often includes considerable informal income-generating opportunities, is being generated by new construction to comply with green building codes and the retrofitting of existing homes, industrial and commercial premises with insulation, low-energy lighting and renewable energy generating facilities, as well as installation and maintenance of green roofs and walls. The same applies

at the neighbourhood and urban scales with installation and maintenance of green-blue infrastructure to reduce urban heat island effect, increase water runoff retention and grey water recycling, and enhance other nature-based solutions and urban biodiversity. All of these are important areas for appropriate local government leadership and collaboration with other stakeholders to leverage complementary investment and maximize a sense of shared ownership.

Alongside improvements in efficiency of space and resource utilization, increased productivity, wages and employment conditions are important, since "[s]ustainable urbanization and productive cities go hand in hand. In seeking to enhance the economic value of urbanization, efforts should be made to ensure that economically productive cities are also environmentally sustainable, resilient, socially inclusive and safe."[26]

Research increasingly emphasizes the importance of understanding enhanced productivity not just in conventional terms but very much as an integral component of holistic urban sustainability. One recent conceptual urban productivity framework comprises the different categories of capital—natural, socio-cultural, human, economic and physical—which should be addressed by means of systemic thinking, equity, justice, co-production, governance and regeneration, all of which are values consistent with the integrated perspectives of this Report.[27] Although not yet tested in detail, this approach appears to hold promise.

10.2.2. The circular economy as a frontier for resilient urban futures

The COVID-19 pandemic is a tipping point that proves the need to adopt the circular economy as an alternative model of resilient and sustainable urban futures, with the potential for unlocking significant social, economic and environmental benefits (Chapter 4). In some contexts, cities were already experimenting with the concept of circular urban economies to promote economic resilience in their urban systems. For instance, London, Paris and Amsterdam were already champions in adopting circular economies to reposition their cities to emerging trends. Such initiatives have the potential to generate new green jobs offering decent work. The effort of individual cities is boosted by the broader European Green Deal, which aims to make Europe the first climate-neutral continent, while ensuring that no one is left behind in the transition. It is important, however, to note that the transition to a circular economy must be carefully planned, considering different factors such as social, economic and political dynamics in each country. There is no one-size-fits-all approach to this transition; each city has a unique urban ecosystem and therefore any repositioning of the local economy should factor in local contextual factors.

Downtown Amsterdam, Netherlands © Shutterstock

10.2.3. Support for the informal sector

A resilient and inclusive urban future hinges on a transformative and just urban economic agenda, which must be driven by policy and programmatic support for the informal sector, particularly in developing regions.

Going forward, city and national governments should make urban policies and plans inclusive by recognizing the contribution of the informal sector to urban economies. The pandemic and other crises have exposed the stark vulnerabilities and structural impediments that continue to undermine the productivity of the informal sector in the absence of tailored support measures. Therefore, a critical element of the transformative urban economic policy is targeted support for informal activities by means of appropriate interventions to address specific vulnerabilities and insecurities of income and livelihood that undermine the resilience of such activities. This also constitutes an effective way for local governments to reduce poverty and promote economic justice for some of the most vulnerable economically active urban residents, especially women, young people, migrants, refugees, and disabled participants, among other vulnerable groups (Chapters 3 and 4).[28] In many cities, informal traders and entrepreneurs are still stigmatized, while their activities are often criminalized and subjected to hostile and repressive urban policies and practices, all of which make it difficult to earn a living in a dignified manner (Chapter 3). Spatial restrictions—often enacted at the behest of formal shopkeepers fearful of being undercut by alleged unfair competition—also preclude them from the areas of highest footfall and should be removed. Any relocations should be carried out only after substantive participatory discussions and negotiations with those affected, as explained below.

A critical element of the transformative urban economic policy is targeted support for informal activities by means of appropriate interventions

Underlying such restrictions are outdated beliefs that informality is somehow inherently bad, inappropriate, parasitic or at odds with modernity. Such views are characterized by the pessimistic scenario of urban futures discussed in Chapter 1. In practice, the informal sector is very diverse, with most actors being poor, often unskilled or only semi-skilled, and trying to earn a livelihood with whatever means they have in a situation of widespread poverty and unemployment. Some activities are gendered, reflecting cultural norms and values in different situations.

Municipal interventions to improve informal economies include establishing more and inclusive legitimate workspaces, facilitating the integration of informal economic actors in urban and regional supply chains and markets, upgrading facilities and improving sanitary and health conditions by building covered markets and manufacturing workshop hubs with suitable water and related infrastructure, and providing access to shared or hired equipment. Even well-intentioned interventions may have the same unintended negative effect if these facilities are located away from main thoroughfares, bus depots, rail stations and interchanges, which is where potential sales and client accessibility are highest. Sanitation and health facilities and regulations should also be appropriate to the nature of the diverse forms of informal enterprises to encourage and facilitate improvements and upgrades instead of forcing them out of business or displacing them. These measures should also consider the heterogenous nature of informal businesses so that their specific needs and priorities are adequately addressed.

Any such new facilities and regulations need to be designed and constructed in consultation with the informal or small entrepreneurs on a participatory or co-design basis so that their requirements can be met, and the process can provide a foundation for developing more positive working relations. Indeed, a helpful way to achieve this is to regard informal enterprises as one category of micro-enterprises. Small, affordable user charges for services that informal traders feel are appropriate and helpful can help to offset municipal costs. These practical guidelines conform to the principles of good practice for inclusive local economic development within integrated urban planning developed by UN-Habitat.[29] In addition to these measures, it is prudent for governments to accelerate the implementation of ILO recommendation 204 towards formalization of the informal economy to tackle the mounting decent work deficits and structural constraints that confront informal sector workers.[30]

Municipal interventions to improve informal economies include establishing more and inclusive legitimate workspaces

This integration should be done in the spirit of social dialogue to create a win-win situation so that the economic fortunes

and productivity of the informal economy can be boosted and their contribution to thriving urban economies enhanced. The transition to formalization should be backed by a combination of different incentives which might include increasing access to social security for business owners and their workers and to business services and public procurement for formalized micro and small enterprises. These policy measures should be locally contextualized and based on the prevailing social, economic and political circumstances in each country. Moreover, such a transformative urban economic policy agenda requires significant political will on the part of elected officials at the national, subnational and local levels.

Building resilience and productive urban futures is not an automatic process; it requires innovative, resilient and sustainable financing instruments

10.2.4. Leveraging new fiscal sustainability frameworks

At the urban level, local governments generally face increasingly severe financial constraints (Chapter 4). Building resilience and productive urban futures is not an automatic process; it requires innovative, resilient and sustainable financing instruments beyond the traditional fiscal tools at the disposal of cities and national governments. The pandemic has reinforced the need for cities to diversify their revenue portfolios outside traditional property taxes and other related municipal rates and charges. Green municipal bonds represent a growing tool for leveraging the scale of capital required for major new green and circular investment schemes to promote sustainability and resilience. Examples range from specific green-blue infrastructure to financing of neighbourhood efficiency and resilience programmes like retrofitting and district heating or combined heat and power. Gothenburg, Sweden's second city and industrial hub, was the first to launch a municipal green bond in 2013 and now has a robust framework for such instruments.[31] In April 2021, Ghaziabad became the first Indian city to issue a successful municipal green bond to fund a water treatment plant to turn wastewater into drinking quality and to extend the piped water network. Kanpur, Agra and Varanasi, also in India, intend to follow Ghaziabad's example and issue such bonds as well.[32] In these contexts, enhancing infrastructural reach and reliability represent important programmes to meeting basic needs securely and achieving the relevant SDGs as contributions to overall urban sustainability and resilience.

The municipal green bond concept has proven increasingly popular in diverse contexts where local governments have the financial autonomy, legal power and creditworthiness

The municipal green bond concept has proven increasingly popular in diverse contexts where local governments have the financial autonomy, legal power and creditworthiness to issue bonds, and the ability to avoid unaffordable debt overhangs. Local governments attracted to such opportunities should examine their legal ability to do so and, if necessary, seek legislative changes to provide them with the necessary powers or at least basis for offering legal surety as a key prerequisite for bond raising. In order to increase funding available to cities more generally and systematically, clear arguments for a green cities development bank have been articulated but, to date, have not been acted upon.[33]

Cities and subnational governments should create enabling environments for effective and sustainable public-private partnerships (PPPs) to finance ambitious urban infrastructure projects, particularly in contexts where public resources are limited. PPPs are becoming a popular mechanism to fund large scale infrastructure investments as these are critical for building resilient urban futures. As noted in World Cities Report 2020, and reinforced in the current Report, cities and national governments cannot do this alone; there is the need to unlock private sector financing through the creation of incentive schemes that attract the participation of private sector players in urban programmes. Additionally, as the World Cities Report 2020 points out, the value of sustainable urbanization cannot be achieved without improving municipal financial mechanisms.[34] Yet, improved municipal finance alone will not provide an adequate basis for achieving economic resilience. Diverse innovative fiscal incentive schemes are being developed and implemented to promote these changes and to promote climate and disaster risk resilience.

These schemes can operate at different scales. At the household and firm level, local governments should provide municipal grants for retrofitting homes with insulation and installation of renewable energy sources (such as rooftop solar panels).[35] Water and sewerage companies, can offer service discounts for properties with rainwater harvesting facilities and permeable surfaces to encourage rainwater infiltration, as available in the UK. Poor households and communities, including those in informal settlements, can access a growing range of individual or neighbourhood/community-level micro-loans or grants to develop enterprises

and undertake neighbourhood risk reduction activities that also enhance public health as proactive interventions.[36]

10.2.5. Infrastructure investments for sustainable and resilient urban futures

For urban areas to achieve the optimistic scenario, investing in key urban infrastructure must be a prerequisite for building sustainable and resilient urban futures. The current infrastructure investment gaps are a huge impediment for building thriving and productive cities in both developed and developing regions. For example, if cities and subnational governments prioritize investments in public transport systems this could generate more economic benefits, particularly for the poor urban residents whose access to jobs is affected by socio-spatial segregation.

Cities should prioritize extending basic infrastructure and services to underserved communities as this could have citywide transformative impacts. For instance, current projections reveal that that a dollar invested in developing water and sanitation infrastructure generates between US$4 and $34 in benefits by improving health outcomes, saving times, and boosting urban productivity.[37] If such incremental gains are realized the current negative trends could be reversed and action will be galvanized towards building inclusive, thriving, resilient and productive urban futures in sync with SDGs and the New Urban Agenda. If national and local governments fail to urgently tackle the current underinvestment in infrastructure, this could undermine urban economic resilience and negatively affect the productivity of cities.

Informal settlements, Younde, Cameroon © Kirsten Milhahn/UN-Habitat

10.3. Social Resilience

As explained in Chapter 3, the multidimensional nature of poverty and inequality necessitates comprehensive cross-sectoral approaches. These represent urgent short- to medium-term interventions as essential prerequisites for increasing ambition towards urban transformations to sustainability and resilience.

10.3.1. People-centred approaches to enhance inclusiveness and reduce poverty

The COVID-19 pandemic has underlined the interdependence between individual and public health, with the highly unequal epidemiological patterns of morbidity and mortality reflecting underlying urban socio-spatial inequalities (Chapter 7). In essence, the built environment has a clear impact on health outcomes. Poorer people, who are more likely to have weaker nutritional and health status, tend to live disproportionately in housing and neighbourhoods that have poor or inadequate infrastructure, public open space, and other amenities and services. Such vulnerabilities also have age, gender and other intersectional dimensions. Hence, context-specific interventions are required to safeguard vulnerable and marginalized urban groups (Chapter 4). The importance of extended family structures, wider social cohesion, and the extent of social and cultural capital can also be crucial factors in mitigating such effects.[38]

National and urban governments have responded in diverse ways; those acting most effectively at first have often been those with recent experience of epidemics like SARS and various strains of bird influenza. Previous experience meant that they had early warning and rapid response capacity as well as important aspects of resilience. In terms of post-COVID-19 recovery, inclusive and integrated policies are required that both tackle the immediate needs and symptoms, and the deeper underlying bases of poverty, inequality and inadequate infrastructure and services in a way that balances socioeconomic rights to achieve social justice.[39]

As we move into the future, cities, subnational governments and other urban actors should urgently prioritize bottom-up approaches when designing urban resilience interventions and in key urban programming. At-risk communities must be placed at the centre of decisions that impact their lives so that new opportunities for tackling urban poverty and inequalities can be unlocked. The failure to prioritize at-risk urban communities means that the 2030 agenda of leaving no one behind will not materialize.

10.3.2. Context-specific social protection schemes

The most successful strategies to create social resilience are likely to combine three elements: neighbourhood-scale interventions to improve physical infrastructure and basic services; necessary upgrades to sub-standard dwellings; and responsive social protection schemes tailored to household requirements. The current COVID-19 pandemic provides an opportunity for global leaders to rethink transformative urban policies and programmes that can radically tackle poverty and inequalities in all its forms and dimensions. The 2021 UN-Habitat report Cities and Pandemics: Towards a More Just, Green and Healthy Future advocates for a "new social contract" in the form of universal basic income, universal health coverage and universal housing and basic services. This new social contract challenges cities and subnational governments to re-imagine what public and social goods they should deliver and under what conditions. At the same time, the pandemic has exposed the gaps in social protection, given the disproportionate impact of COVID-19 containment measures on some of the most vulnerable groups in cities.

Urban-sensitive social protection schemes are potentially, a powerful tool to redistribute wealth, address income inequalities and tackle multiple vulnerabilities that affect the most marginalized groups (Chapter 1). Some social protection schemes, like universal basic income schemes and affordable health insurance, are normally national government responsibilities, although some devolved federal or similar systems provide health insurance at the regional level. Cities and subnational governments should design tailored social protection interventions for informal workers. Extending social protection to informal sector workers is critical for inclusive development and resilient urban futures. Governments at all levels should design policies and programmes to support the formalization of informal businesses and enterprises with access to social protection; extending statutory coverage to previously uncovered workers; adapting benefits, contributions, and administrative procedures to reflect the needs of informal workers; and subsidizing contributions for those with very low incomes. Doing so will ensure livelihood and income security, especially when faced with economic disruptions and other external shocks and stresses.

Cities, subnational governments and other urban actors should urgently prioritize bottom-up approaches when designing urban resilience interventions and in key urban programming

Food vendors at a slum in Bangladesh, Dhaka © Kirsten Milhahn/UN-Habitat

In designing social protection interventions for informal sector workers, cities and subnational governments should consider gender-related risks since women and other vulnerable social groups bear the brunt of economic hardships and vulnerabilities associated with informal work. Moreover, resilient, and equitable urban futures could be realized if governments ensure access to subsidized basic services for the most vulnerable urban households and ensure access to adequate and affordable housing for all. Cities and subnational governments should formulate tailored strategies that respond to different form of vulnerabilities. Social protection interventions should be nuanced and wide-ranging to ensure the different risks and vulnerabilities associated with gender, age, ethnicity, migratory status, and other characteristics are effectively identified and tackled in urban welfare programming.

Extending social protection to informal sector workers is critical for inclusive development and resilient urban futures

10.3.3. Fostering social change and improving social well-being

Integrated urban planning should be an instrument for promoting social and spatial integration and inclusion, especially by improving access to all areas within the city and its territory. Greater connectivity means that all inhabitants, including the poor, marginalized, displaced and migrants can benefit from the socioeconomic opportunities, services, public spaces and other facilities in a city, and contribute to its social and cultural life. Integrated urban planning also protects and values all elements of cultural heritage, not just in a backward-looking sense but, crucially, in terms of how contemporary cultures, identities and heritages can play valuable roles in promoting locally appropriate urban sustainability and resilience.[40]

Neighbourhood or larger scale municipal interventions to foster behavioural change, reduce vulnerability and promote well-being can include brownfield redevelopments and design of mixed housing areas in new developments to avoid social and economic segregation that reinforce disadvantage and undermine resilience of the most vulnerable social groups. Beyond basic infrastructure

and services, access to appropriate green space is also an important element of well-being.[41]

Although not cited explicitly as an objective of integrated urban planning guidelines, social and cultural resilience is indeed an outcome of their appropriate implementation by strengthening geographical proximity between residential, livelihood and social activities. Proximity in line with the principles of the 15- or 20-minute city enhances residents' sense of belonging to a neighbourhood or district, improves quality of life and reduces economically-based residential segregation across metropolitan areas. These benefits also constitute a key element of the social equity and justice dimension of urban sustainability and resilience.[42]

10.4. Environmental Resilience

Notwithstanding the assertion by some critics that urban sustainability and resilience are often used almost synonymously, as discussed earlier, the following quote from UN-Habitat is explicit that the attributes of environmental sustainability are likely to facilitate integration and resilience: "Environmentally sustainable cities are likely to be more productive, competitive, innovative and prosperous. These cities are able to draw a healthy balance between economic growth and the environment, in the process facilitating integrated development and resilience."[43]

One fundamental and inescapable characteristic of cities and urban systems is their complexity, especially in terms of the human environment and the relationships and interactions that underpin them. While cities are human artefacts, their health, sustainability and resilience are critically dependent on these relationships. Indeed, they may be conceived as complex social-ecological-technical systems.[44] Accordingly, much attention now focuses on fostering nature-based solutions and ecosystem services as essential to reducing urban heat island effect, controlling pests, reducing rainfall run-off and erosion, increasing food production, and making cities more liveable and just for all inhabitants.[45]

As research into the impacts of the COVID-19 pandemic has recently shown, green and public open space is inequitably distributed across the urban fabric, with the poorest, most densely populated areas generally least well served and having access to far less land per person. The logic of urban greening and environmental improvement, particularly to enhance environmental justice and equity, might therefore seem indisputable. However, initiatives to restrict land uses or to increase green and blue space are often highly controversial and can be hotly contested by different stakeholders, particularly when other land uses might be regarded as having higher values or greater importance, not least for livelihoods and homebuilding by and for the poor. Spatial, social, economic and environmental justice issues must therefore be taken fully into account as part of integrated transformative urban planning.[46]

This section highlights two areas of intervention shown by increasing volumes of recent research to be important in promoting environmental resilience as part of integrated strategies, namely investing in green-blue infrastructure, and in sustainable renewable and cleaner energy.

10.4.1 Investing in green-blue infrastructure

The concept of green infrastructure, used to denote the use, expansion and conservation of parks, riverbanks and other wetlands and green open spaces within urban areas on account of their ecosystem services, has been widened to green-blue (or blue-green) infrastructure (GBI) in recognition of the intimate interrelationships between land-based and aquatic biodiversity. Treating both green and blue natural systems as essential elements of environmentally-friendly infrastructure respects the fact that vegetation and waterways often weave integrated networks through an urban area. This lens facilitates planning and sustainable utilization, as well as the enhancement of biodiversity.

Conversely, a lack of coherent planning and clear, transparent governance (including over land) leads to fragmented outcomes and loss of green spaces—up to 80 per cent in the case of Kumasi, Ghana, from 1991 to 2019.[47] The rapidity of changes in green space coverage and composition—which are effective proxies for biodiversity and environmental value—has been widely documented in different contexts, including through use of a comprehensive assessment methodology using remote sensing and GIS in Chinese cities.[48] With appropriate interventions as part of integrated planning, this coverage and quality can increase, as illustrated by detailed studies of drivers and processes—including the political dimensions involved—in Shanghai and the Australian cities of Canberra, Melbourne and Sydney.[49]

With the frame widened to GBI, the positive effect can be further amplified, especially if participatory and co-productive processes are used to convince water users of the benefits in terms of improved water and riparian quality.[50] Until recently, research and policy on GBI was concentrated in North America, Europe and Australasia, but has become almost

universal since its importance for climate change mitigation, adaptation and resilience has become widely appreciated. Pertinent well-documented case studies include the Ebro Delta and Empordà in Spain, New York's Staten Island Bluebelt, Seattle's Thornton Creek Water Quality Channel, the Serra do Mar project in Baixada Santista Metropolitan Region (Brazil), ecosystem-based adaptation in Cape Town and Singapore, the Gazelle Valley Park Conservation Programme in Jerusalem, and Transforming for Life in Medellín.[51] A recent review has found some commonalities—such as a persistent focus on individual categories of green space—but also national and regional differences in terms of the extent, uses and development approaches towards such infrastructure across Latin America, Africa and Asia.[52]

Governance arrangements for GBI are evolving with international assistance through bilateral and multilateral initiatives. Global city networks are building awareness and enhancing local capacity to utilize effectively the tools afforded by international treaties and conventions on biodiversity protection and enhancement. In fact, city collaborations and city networks involving the environment have grown rapidly and constitute the largest share of such networks globally.[53] In addition to global networks such as C40 Cities and the Global Resilient Cities Network, smaller and regional research and learning networks have proved valuable (Box 10.2).

A set of globally applicable core principles for GBI has been distilled by combining conceptual issues with lessons from the available case study literature. GBI should be multifunctional; needs to be connected (as opposed to comprising isolated pockets); integrate green, blue and grey elements; and have multiple scales; while it is developed through strategic, inter- and transdisciplinary processes that are socially inclusive and reflexive.[55] These features are explicit so that they can serve to integrate GBI spatially and in governance terms with other sectoral resilience agendas on poverty, inequality and justice.

10.4.2. Sustainable, renewable and cleaner energy

As energy quite literally drives or enables all facets of human settlements, having equitable access to adequate clean and sustainable energy is fundamental to achieving overall urban sustainability and resilience. What makes energy clean and sustainable comprises two closely related dimensions, namely the fuel source of the energy and the nature of the supply infrastructure in relation to actual and suppressed demand. Debates over the unsustainability of finite, non-renewable and polluting fossil fuels use are well known, and the nature of alternatives will be discussed below, but urban planning for an optimistic future scenario must take account of recent developments in renewable energy generation that enable different and more resilient supply infrastructures. Already

Box 10.2: ICLEI's Urban Natural Assets for Africa Programme (UNA)

ICLEI Africa's Urban Natural Assets for Africa Programme ran from 2014–2020 as an excellent example of a regional GBI learning network across Addis Ababa, Cape Town, Dar es Salaam, Lilongwe, Kampala, Kisumu, Entebbe (Uganda), and Nacala and Quelimane (Mozambique). This network shared understanding and experience about rivers, coasts and overall resilience, augmented by access to current international thinking and practice.

The fundamental objective was to promote "human well-being and climate resilience by integrating nature-based solutions into land-use planning and decision-making processes." It operated through very reflective and adaptive learning and knowledge exchange mechanisms that enabled the tailoring of experience elsewhere and principles of good practice to local contexts through co-production processes. In turn, the participating cities shared their practices and lessons, while ICLEI helped disseminate these practices regionally and globally, hence enabling bidirectional cross-scale knowledge sharing.

Key findings included that identification of appropriate decision-making entry points was inadequate. Instead, cities needed to embark on continual learning, knowledge production and critical reflection as part of a fundamental reorientation of planning processes away from expert knowledge towards co-design and co-creation. Innovative learning and exchange formats, including games and interactive exercises, proved important devices for achieving this goal by helping to level the power dynamics and other differences among participants. For instance, the network brought land-use planners and environmental officers in Lilongwe City Council in Malawi together across departmental silos to share perspectives and explore their conflicting disciplinary and professional rationalities around these issues.[54]

in 2009, the UN-Habitat report Planning Sustainable Cities identified the potential in this regard of decentralized systems:

Decentralized energy production systems offer a number of benefits, including energy savings, given the ability to better control power production, lessen vulnerability and achieve greater resilience in the face of natural and human-made disaster (including terrorist attacks). Clever integration of these small systems within a grid can be achieved with new technology control systems that balance the whole system as demand and supply fluctuates. A number of such small-scale energy systems are being developed to make cities more resilient in the future.[56]

Most major cities are taking leading roles in seeking to meet the Paris target through ambitious emissions reduction targets

Over the 14 years since that was written, progress has been remarkable, driven by growing urgency, the increasing obsolescence of older fossil fuel power stations, rapidly growing demand for electricity through population growth, rising incomes, and the vast expansion of electronic equipment and now also electric vehicles. Technical progress and the plummeting cost of photovoltaic (solar) panels, wind turbines of different scales, and early commercial tidal energy installations are all playing important roles in the rapid and impressive increases in renewable energy capacity around the world, even in countries that appear to favour fossil fuel industries or minimize the climate change threat. Given obsolescence and capacity constraints facing conventional national or regional energy grids and the scale of investment required to address these, urban distributed and decentralized energy systems for climate-resilient, post-COVID recovery are vital elements of resilient urban futures.[57]

Globally, the International Energy Agency has now charted a clear pathway towards net zero by 2050, demonstrating the importance of a portfolio of energy sources and supplies, underpinned by a rapid transition out of fossil fuels to the range of renewables and appropriate financing funds to assist developing countries and promote energy justice at different scales.[58] These issues are also addressed substantially in Chapter 5. By contrast, commitments at COP26, including the agreement to curtail methane emissions and a doubling of financial assistance, provide a first but insufficient step in this direction. Most low- and middle-income countries, along with some high-income countries, strongly favour substantial increases in the voluntary Nationally Determined Contributions to emissions reductions. However, some large emitters and major fossil fuel producers resisted, and the sum total of Nationally Determined Contributions announced will not reduce temperature increases over pre-industrial levels below 2.4–2.7°C, a considerable and damaging amount way short of the 1.5°C Paris target.

Most major cities are taking leading roles in seeking to meet the Paris target through ambitious emissions reduction targets, increasingly as part of integrated strategies embracing mitigation and adaptation as transformative commitments to sustainability and resilience. City networks, including UCLG, ICLEI, C40 and the Global Resilient Cities Network, are playing leading roles in generating collective will and sharing good practices, as is the biennial One Planet City Challenge run by WWF Sweden on behalf of WWF International.[59] Cities not already engaged in global networks of local governments for climate action should no longer sit on the sidelines if they wish for their city to achieve the optimistic scenario for urban futures, as these networks support and encourage individual mayors and top officials, who can make a real difference individually in their respective cities' agendas in bridging the gap between vision and action.[60]

In urban contexts, the importance of strategic assessments of energy systems and greenhouse gas inventories as the basis for concerted action is now well established.[61] A series of recent studies of macro-metropolitan São Paulo also identifies the many political constraints and contradictions impeding successful energy transitions, and what further potential exists.[62] Such issues exist almost universally, not least in terms of vested interests contesting the basis or rate of transition to sustainable and renewable energy, although the changing economics of renewables is starting to prove a game changer.

Moreover, the new opportunities presented by the surge in renewables are particularly important as old power plants are retired and efforts to expand affordable access to electricity among the poor and in underserved localities increase. Combinations of off-grid, local mini-grid and on-grid solutions are now possible, though sometimes limited by regulations. Scalability is also very important, so that individual households, community organizations and firms in many countries can invest affordably to generate some or all of their own electricity. Depending on the precise technology, this can either be stored for use at night or sold to the grid. Donor agencies, NGOs and community-based organizations are also funding innovative schemes to install power in informal and low-income settlements that are not

connected to the wider urban grid. As mentioned above, such investments are important because of their economic and social dimensions, in terms of employment creation and impact on reducing poverty, inequality and ill-health. While some schemes are grant-based, others require affordable repayments over a stipulated period, with repaid funds sometimes being recycled into new loans on the principles of a rotating credit scheme.

This potential to fill gaps in grid coverage and provide affordable renewable energy constitutes a key element of poverty reduction and health improvement as part of an integrated urban sustainability strategy. These types of energy also avoid the safety and health risks, as well as emissions, associated with use of kerosene, paraffin, candles and firewood in extremely low-income households. In situations where electricity grid supply is unstable or unreliable, having off-grid or local mini-grid supplies may be more reliable and sustainable, as well as resilient. Citywide rooftop solar schemes, such as in Palmas, Brazil, are demonstrating the scalability of renewable energy and various co-benefits.[63] Access to alternative sources and supplies also provides the redundancy that is an important component of resilience. As older solar panels come to the end of their working lives or need repair, issues around the right to repair—which could provide many new semi-skilled employment opportunities—and the growth of a new form of e-waste also need to be considered.[64]

10.4.3 Raise awareness of different local urban risks and identification of feasible disaster prevention and preparedness

Sustained research on chronic hazards and longer-term climate change risks facing different groups of residents and localities within urban areas have informed urban risk profiles. Many local governments have undertaken comprehensive vulnerability assessments and established disaster risk reduction and climate change mitigation and adaptation strategies, including early warning systems for floods, landslips and droughts. Awareness and preparedness raising exercises appropriate to the particular contexts are important, so that residents know where to obtain reliable and up-to-date information and how to respond to the various categories of emergency.

In Shimla, Himachal Pradesh, India, for instance, the local authority, with assistance from ICLEI and 100 Resilient Cities, has formulated comprehensive landslide and earthquake disaster and resilience strategies, with public engagement. In Buenos Aires; Malmö, Sweden; and Sheffield, UK, attention has

Many local governments have undertaken comprehensive vulnerability assessments and established disaster risk reduction and climate change mitigation and adaptation strategies

The aftermath of cyclne Iday, Beira City, Mozambique © Victor Espadas Gonzalez/Shutterstock

focused principally on flood risk, with imaginative awareness raising strategies and mitigation strategies including a shift from traditional hard engineering solutions towards nature-based solutions and ecosystem services such as restoring and expanding riverine vegetation and floodplains, as well as enhancing run-off retention and water infiltration of the soil.[65] Particular issues often arise in respect of informal settlements and their inhabitants, where legitimate community-based organizations play important roles in mapping, data collection, negotiations and providing mutual assistance.

10.4.4 Building resilience in slums and informal settlements

A key requirement for effective, integrated citywide planning and resilience building—which is discussed more broadly below—is that it should promote socio-spatial and economic equity. This means explicitly including areas and social groups facing particular vulnerabilities and high risks, most of whom are relatively and often absolutely marginalized and impoverished, living in informal housing and surviving through informal economic activities (Chapter 3). Informality exists universally but in many developing countries it characterizes substantial segments of the built-up area and population.[66] These planning processes must be seen as legitimate among slum and informal settlement dwellers, many of whom are only too aware of the chronic daily risks and hazards of their lived experience but also lack the resources to resolve them independently. A vital step to promote such policy legitimacy and remove a major source of vulnerability among the most marginalized groups is for local governments to cease the still widespread use of demolition or eviction (Chapter 3). Rather than literally being planned out of urban areas, such areas should be planned into towns and cities through the inclusive and equity-promoting policies advocated here.

A wealth of experience has been built up through community-based initiatives worldwide, using diverse approaches but generally through shared labour and self-help processes, childcare and education enterprises, rotating credit and collective savings schemes and the like. During high-risk periods, wardens or lookouts can watch for approaching floods, impending landslips, storms, firestorms and other hazards to provide early warning to residents. Many of these modest initiatives—sometimes supported by external NGOs—provide elements of resilience that can be enhanced and integrated with wider multisectoral urban programmes if trust and collaborative relations with officials and the planning system can be developed (Chapter 8). This will take time and goodwill on all sides, which underlines the value of multistakeholder engagement, making use of skilled external facilitators and demonstrating to residents that their knowledge and experiences are valued alongside those of other, more powerful groups and professional planners. Many participatory and co-design, co-creation and co-production techniques have been developed in diverse urban contexts worldwide to help foster such processes.[67]

Participatory slum upgrading session © UN-Habitat

The Know Your City programme of the Federation of Shack and Slumdwellers International (SDI), in collaboration with United Cities and Local Governments of Africa, is well-established and engages residents as citizen scientists to map and collect data on their neighbourhoods as the basis for negotiations and collaborations to provide and upgrade services and infrastructure and improve disaster risk reduction capacity and resilience (Chapter 6).[68] Ideally, individual neighbourhood initiatives should be "joined up" so that drainage and stormwater improvements are accompanied by enhancements to pathways, access routes and other infrastructure, including water supply and sanitation, to make them more resilient to storms, floods, fires and other locally important extreme events.

Such initiatives have provided an important basis for rapid interventions during the COVID-19 pandemic to raise awareness and improve emergency or more durable facilities for handwashing and related personal hygiene and sanitation measures to prevent or slow contagious spread of the coronavirus in high-density areas with inadequate facilities.[69] These, in turn, point to longer term interventions required as part of upgrading and integrated planning initiatives to promote public health and environmental resilience in such areas (Chapter 6).

Informal and formal low-income dwellings can be made more resilient to heavy rain and flooding through improved roof overhangs, rainwater harvesting and strengthened footings to protect the base of the walls. Resilience to heat and cold can be enhanced through cost-effective ceiling insulation, perhaps accompanied by affordable and appropriate energy generation through solar water heaters, as demonstrated by the Kuyasa scheme in Cape Town, to maximize co-benefits.[70] Reducing fire risk in homes constructed from flammable materials like wood, cardboard and plastic, particularly because many inhabitants also rely on open fires, candles and paraffin or kerosene for cooking and heating, is also crucial to promoting resilience at this scale.

Such interventions have been documented and supported through other initiatives, as well as the Asian Coalition for Community Action, and collaborative efforts in and with informal settlement dwellers from Buenos Aires to Kisumu to address community priorities to reduce flood risk, vulnerability, water and sanitation and other sources of daily and climate change vulnerability and to build resilience. These initiatives are crucially important in engaging active participation and, in some cases, co-design and co-creation with residents and other beneficiaries. This generates buy-in and community sense of ownership, while reducing alienation or dependence. The quality and adequacy of the schemes may vary but local ownership might make them more durable and encourage maintenance beyond what conventional local government interventions generally achieve. Ultimately, it is important that these are not seen as purely filling gaps or as substitutes for official action, but that they become integrated with the latter as part of comprehensive urban planning and action to build holistic, multistakeholder and cross-sectoral urban resilience, as elaborated on in the next section.

Informal and formal low-income dwellings can be made more resilient to heavy rain and flooding through improved roof overhangs, rainwater harvesting and strengthened footings

10.5. Institutional Resilience

The UN-Habitat Global Report on Human Settlements 2007, focused on the theme of human safety and security. Even then, the report's scope included extreme events and disasters in terms that remain both valid and important today. Specifically, the report underlined the key message that governance structures and processes are only as good as their weakest component: "Disasters reveal the resilience and capacity of governments. The performance of infrastructure is a reliable indicator of how well public agencies are doing their jobs. Similarly, the performance of departments within government, as well the performance of leaders, is deeply revealing of the strength and character of public institutions."[71]

Put differently, this means that the sudden and severe shocks that constitute disasters, rather than the performance of ordinary daily functions, show how effective, efficient, flexible and responsive governments and their capacities are. Whereas rigid, bureaucratic and unaccountable systems usually falter when faced with substantial emergencies because they tend to alienate rather than involve or have the confidence of most inhabitants, more flexible, efficient, well-organized and responsive systems often have preparedness and can respond in a timely fashion. At the same time, it is important to bear in mind that resilience cannot be created by economic resources and wealth alone. Above all, there is no substitute for good governance.

As this Report has demonstrated, knowledge and understanding of different natural and anthropogenic hazards, risks, vulnerabilities and how to build capacity to mitigate, adapt and resilience has grown immeasurably over the last 15 years. However, even where sufficient political commitment and resourcing exist, there remain substantial implementation and capacity gaps. A large recent international study of some 200 cities revealed little evidence of just sustainability principles yet having been implemented on the ground.[72]

The rate and scale of climate change, as well as our understanding of its impacts, have also increased over the intervening years, with the result that the urgency and nature of adaptive transformations now required to achieve just and sustainable urban resilience are commensurately greater. This transformation can only be achieved with greater resolve and commitment by all government institutions, including local government leaders.

10.5.1. Building stronger and nimbler multilevel collaboration

Climate change, pandemics, sustainability and resilience are classic examples of "wicked problems," a concept in planning and policy that refers to problems difficult or near impossible to solve. Given that scale of challenge, no level or tier of government—no single ministry, department or agency—can address them alone. Indeed, all must collaborate effectively. The necessity of this level of collaboration underpins the entire global sustainable development agenda, particularly the SDGs and the New Urban Agenda, because of the difficulty in tackling multidimensional poverty, inequality and vulnerability.[73]

Establishment and operation of effective and efficient multilevel governance requires clear divisions of labour, powers, responsibilities and resources among national and subnational government entities.[74] It also requires multistakeholder collaboration among government institutions, private firms, civil society and other NGOs, higher education institutions and the like. Collaborative governance also builds confidence and trusting relationships. Indeed, early optimism on this score regarding urban governance in the few years after the COP15 summit in Copenhagen was subsequently replaced by greater pragmatism.[75]

Effective multilevel governance may be difficult to achieve, particularly in situations where cross-scale relations are historically fraught or complicated by authoritarianism, lack of transparency and/or political rivalries when different parties or interest groups control the respective levels of government institution. Moreover, changes in political control, particularly when combined with strong executive power vested in a president, regional minister or executive mayor, can change dynamics rapidly and even reverse previous gains and thus undermine resilience directly or indirectly. This reality highlights the importance of engaging proactively with the politics of climate change and resilience, including both sharpened contestations and innovative collaborations and coalitions to exploit and develop areas of common interest, as well as everyday politics by those outside the corridors of power, especially informal community-based institutions of the poor and marginalized.[76]

Since the funding and revenue cuts, and increased demands on, urban local governments triggered by the 2008-9 global financial crisis, the ability of European cities to innovate and govern economic change and social challenges has depended largely on the existence of supportive multilevel governance.[77] Another important cautionary example is provided by the fate of climate change measures and progress with emissions reduction and decarbonization under successive Brazilian presidents. Important gains during the first decade of the 2000s have subsequently been undermined and reversed through a combination of political resistance, bypassing regulations, direct legislative change, and the weakening or closure of specialist institutions.

This experience applies equally to collaborative multilevel governance and the role of urban institutions, with climate change and resilience agendas mainstreamed across all mandates rather than being the preserve of specialist departments or institutions. One important strategy for tackling policy volatility across local electoral cycles and reducing the vulnerability of local government programmes to changes in national or regional policy is to seek cross-party agreement on the importance of urban sustainability and resilience so that measures implemented during one cycle are consolidated and built upon in subsequent cycles rather than reversed. This type of institutionalization of resilience policy has been done successfully in countries with proportional representation electoral systems where governance usually takes place through coalitions, particularly in Scandinavia, but such broad agreements can be achieved even under other systems if the respective leaderships accept the importance of doing so.

Effective multilevel governance may be difficult to achieve, particularly in situations where cross-scale relations are historically fraught or complicated by authoritarianism

10.5.2. Well-funded and resourced local governments

Local governments, especially in urban areas, are on the frontline of addressing climate change and COVID-19 and having to reduce vulnerability and enhance resilience. Yet they frequently suffer from longstanding shortages of personnel, resources and implementational capacity relative to their legal mandates and responsibilities, let alone to address the substantial and substantive transformational changes now required. The most common challenges are a lack of local revenue raising ability and heavy dependence on central and/or regional governments for disbursements, and additional tasks and roles being assigned to local government without appropriate funding—sometimes referred to as unfunded mandates.[78] This may reflect inadequate central government revenues or political centralism that means that allocated resources are not transferred to lower tiers of government.

The phenomenon of unfunded mandates has been widespread during the COVID-19 pandemic, when local governments have been called upon to intervene in diverse ways. The weakened fiscal capacity of cities and subnational governments, which in turn affects their capacity to tackle persistent and emerging urban challenges is indicative of the disastrous scenario of urban futures described in Chapter 1. Even many historically well-funded local governments in OECD countries have suffered successive financial cuts since the financial crisis (Chapter 4); the larger Nordic cities are notable exceptions.

Fundamental to overcoming this situation are two governance requirements. The first is to clarify an appropriate balance of complementary roles with respect to climate change, disaster risk reduction and resilience building across national, regional and local governments. The second is to reach an equitable resolution of the mismatches between the powers, roles and responsibilities of urban local governments on the one hand, and their resourcing on the other. This may be very difficult to achieve in strongly centralized and authoritarian systems. If internal democratic pressure is inadequate, international agencies or city networks might be able to help facilitate dialogue and some form of national debate or consultative mechanism to assist national governments to find the means to address and meet international conventions or agendas to which they have signed up.

The most appropriate solution will also differ according to local circumstances, such as existing institutional capacity of local governments of particular categories and their ability

Many historically well-funded local governments in OECD countries have suffered successive financial cuts since the financial crisis

to raise revenue locally from property, vehicle and/or local income or sales taxes, service provision, and sale of utilities such as water and electricity. The higher the proportion of total revenue that can be raised locally, the greater the level of de facto autonomy a local government will have, the better it will be able to develop and implement coherent strategies, and the more responsive it can be to local priorities and hence accountable to residents. Therefore, these solutions should be promoted; some can be addressed by local governments alone, but most will require multilevel governance negotiations since they affect divisions of labour and resources among them.

10.5.3. The role of new technologies in steering urban resilience

Technologies continue to evolve very rapidly, creating new potentials to accelerate urban change and transformations but also new challenges about their appropriateness to diverse contexts and their wider impact on equity, justice and well-being (Chapter 9). This is the essence of the social dimension in socio-technical approaches and the understanding of cities as socio-technical-environmental systems.[79]

The rapidity of technological evolution can make it difficult to judge appropriateness in the short term, as cost, availability and accessibility can change over time. Two good examples are solar panels and mobile phones. Initially they were expensive as well as required supporting infrastructure, installation and maintenance capacity that rendered them accessible mainly to the elite and middle classes in large cities. However, dissemination and technological refinement have been rapid, even in low-income countries, with the result that both are now widely available and accessible at affordable cost, so that both now make important contributions to resilience at individual, household, neighbourhood and hence urban scales. (Solar panels were discussed earlier.) Mobile phones connect traders to customers, provide access to instant market information from different locations, facilitate maintenance of social contacts among family and friendship networks, enable money transfers cheaply at a distance, enhance personal safety, assist female entrepreneurs to overcome gender barriers and can be a source of early warning of impending extreme events and disasters.

Related developments in digital technologies also facilitate citizen science and community mapping as part of participatory and co-productive neighbourhood upgrading and planning negotiations, which is consistent with the idea of civil technology (Chapter 9).[80] Networked data sensors and closed-circuit television cameras measuring air quality, traffic and pedestrian flows and many other elements of urban metabolism, as well as antisocial behaviour and crime, are increasingly integral to environmental monitoring and mobility management to cut airborne pollution, congestion and ultimately promote urban sustainability and resilience.

However, as noted in Chapter 9, the equity and justice dimensions to such technological deployments are often overlooked. Who benefits and who suffers when constraints and monitoring are introduced? There are costs and benefits of, for example, traffic detours through neighbouring streets when pedestrianization schemes are introduced or policing abetted by technological surveillance. Similar issues surround the enthusiasm for smart cities, which are often held up as the future of urban sustainability but which, to date, are largely high-tech and high cost in ways that encapsulate many elements of unsustainability and exclusion, particularly of the urban majority and poorer developing countries. This has prompted efforts to embrace open data and open-source technologies as part of community involvement as mentioned above. Social aspects of smart city living are also now receiving more attention, with Tampere in Finland, for example, adopting a more citizen-focused phase after their initially strong technological emphasis.[81]

Carbon capture and storage represents another controversial potential example, where, as a result of greater urgency and technological progress, perceptions are shifting from it being unrealistically expensive and large-scale to having possibilities at different scales. However, this could thus become a mechanism for extending or perpetuating business as usual approaches based heavily on fossil fuel combustion rather than accelerating transitions to renewable energy. In this context, the importance of transforming private-sector business models to align with urban sustainability requires a change in underlying parameters of added value and how private costs and benefits are calculated relative to externalized social costs and benefits.[82]

Solar Panela at a parking lot © KIM JIHYUN/Shutterstock

10.5.4 Integrated urban planning as the foundation of resilient urban futures

Integrated urban planning is an essential component and prerequisite for resilient urban futures. Sometimes called "joined-up planning," it requires bringing together the various sections or departments of a local government to discuss and negotiate their respective priorities, proposals, plans and associated budgetary needs into an overall framework that also includes a spatial or territorial dimension so that the entire urban area can be addressed coherently and the whole becomes more than the sum of the respective sectoral and

Integrated urban planning is an essential component and prerequisite for resilient urban futures

locality-specific parts.[83] Apart from the missed opportunity of such added value, failure to integrate at the city or city regional scale risks contradictions and gaps between various locality and sectoral plans, and may even increase vulnerability. A city region embraces the functional urban area, which is larger than the urban built-up area. This is more useful in terms of resource flows and sustainability, as well as transport and mobility planning, but adds complexity as such regions include peri-urban and some rural areas.[84]

In simple terms, this helps to avoid a situation where individual departments prioritize development or rehabilitation work in different localities or in the same locality at different times. Such situations lead to inefficiency, greater disruption and cost, and suboptimal outcomes. Instead, effective coordination means that the various elements of infrastructure, buildings or services are designed, delivered or upgraded together. This approach maximizes complementarities and efficiency. The number of cities undertaking such exercises is increasing, partly through the catalytic role of international membership organizations, though Cape Town has been working on disaster risk reduction and climate change mitigation and adaptation at the city scale for over a decade, gaining invaluable experience that bears out the arguments being made here.[85]

Holistic urban resilience requires that proactive responses to climate change, pandemics and disaster risk are mainstreamed into the annual and multiyear workplans and design standards of all departments, and not undertaken as an extra bolt-on to other work or concentrated in one

Holistic urban resilience requires that proactive responses to climate change, pandemics and disaster risk are mainstreamed into the annual and multiyear workplans and design standards

specific department. In turn, this requires effective forward-looking design and planning frameworks that factor in local forecasts of future climatic, environmental and public health conditions so that infrastructure, buildings and services are built or retrofitted to appropriate standards to withstand best estimates of conditions that will prevail over the coming decades. The New Urban Agenda provides appropriate parameters and guidelines for this.[86]

Urgent direct attention is required to change the form and function of existing urban areas to promote comprehensive sustainability and resilience (Chapter 5), just as new urban construction needs to accord with the latest design principles, construction techniques and sustainable materials in any given context to avoid locking in unsustainability for decades to come. This is essential to integrate the economic, environmental, social and institutional dimensions of resilience within the urban fabric.

One key element of this is the imperative to rethink urban land-use and transport systems and requirements in order to reorganize large, mainly single-use and mobility-based urban areas into more nucleated, 15- or 20-minute cities or communities (Chapter 6).[87] They embody the step changes needed to match the scale of our looming challenges but have yet to be retrofitted or tested in practice outside a few recent model smart city neighbourhoods that are not likely to be widely replicable. Ironically, perhaps, there will be greater potential to upgrade and modernize infrastructure and facilities without large-scale redesign and reconstruction of the built environment in older, central areas of cities and towns in some low- and lower-middle-income countries where multifunctional land uses have survived from the colonial era. In some high-income countries, inner-city neighbourhoods often retain mixed land uses and have integrated infrastructure like district heating and integrated transport systems, enabling them to function both as 15- or 20-minute districts and as integral parts of the larger city.

A crucial example of the kind of reorientations of thinking and urban design required to make such step changes in practice is provided by recent research into the relationships between residential densities and construction materials. The longstanding conventional wisdom has

Neighbourhood profile data validation in Old Saida, a vulnerable neighbourhood in South Governorate, Lebanon © UN-Habitat

been that maximum urban efficiency in terms of land use, infrastructure and service delivery is provided by increasing residential density through fuller ground coverage and especially more extensive vertical development—high-rise, high-density development. This perception, however, has been based largely on the operational costs and efficiency of buildings after construction. When the full life cycle of buildings is considered, including construction materials, actual construction processes[88] and subsequent operation, the picture changes considerably. Instead, high-density, low-rise urban designs are optimal in terms of minimizing life cycle emissions and maximizing population capacity.[89] When social dimensions and overall liveability are taken into account, the arguments against maximizing residential density as an objective in and of itself become even stronger.

Only a full life cycle approach is entirely compatible with achieving urban sustainability and resilience. This should certainly be a medium-term objective, though it will require considerable preparation in all but the best-resourced and capacitated local governments. As with 15- or 20-minute cities or neighbourhoods, detailed practical experiments are still awaited but the concept should serve as an invitation to experiment.

The language and terminology, as well as available technologies and our understandings of climate change interactions with the built environment and the implications, continue to evolve. However, the essential message about comprehensive change being essential was already identified by UN-Habitat in 2009: "While greening buildings, developing renewable fuel sources and creating more walkable communities are critical elements of the sustainable city, investing in viable, accessible transit systems is the most important component for them to become resilient to waning oil sources and to minimize the contribution of urban areas to climate change."[90] While there has been undoubted progress in many towns and cities, including on renewable energy and decarbonization, the urgency is now even greater. Modest, incremental changes are no longer adequate; instead, more ambitious and comprehensive transformative adaptations— sometimes referred to as adaptive transformations—have now become essential.

10.5.5. Building required capacity for sustainable urban futures

Examples of how integrated planning capacity and frameworks can be developed as part of initiatives led by international city networks are provided by Buenos Aires and Cape Town, which took advantage of their membership in the Rockefeller Foundation's 100 Resilient Cities network to formulate their city resilience strategies (Box 10.3). Rather than being top-down efforts that were externally driven by the global network, these were both essentially internal municipal undertakings, using their considerable internal skills and capacities to bring together the various previous fragmented and sectoral policies and strategies, updating and adapting them for coherence at the same time to fit into the integrated framework, and amenable to monitoring in terms of the City Resilience Index.[91] The examples in Box 10.3 demonstrate how local governments in diverse contexts can formulate comprehensive resilience strategies, whether framed by the CRI or other tools.

Box 10.3: Comprehensive city resilience strategies: Buenos Aires, Cape Town and Gothenburg

Some 70 per cent of Buenos Aires' population live in one of 11 stream basins crossing the city, with about 25 per cent vulnerable to extreme flooding. This feature constitutes the principal environmental and climate change risk in the metropole, resulting from modification of and encroachment into the riverine zones, along with most of the water flows having been piped. The Rockefeller Foundation's 100 Resilient Cities initiative stimulated the city's resilience strategy, which is focused around four key issues of becoming a green city, an integrated city, a city of opportunities and a safe city. These key issues are intersected by three cross-cutting themes (a metropolitan perspective, citizen participation, and a digital city), all supported by five pillars: diversity, gender and co-existence; innovation, talent and opportunities; environment and sustainability; social and urban integration; and security and risk management.[92]

Cape Town also regularly faces heavy flooding in low-lying, high-density areas, including informal settlements, as well as cyclical droughts and water shortages. Recognizing the challenges of climate change, it had previously formulated policies and plans on a sectoral basis, with separate mitigation and adaptation strategies. These have now been integrated and organized thematically, along with other dimensions of resilience-building that take account of financial constraints and the unique local environment, which underscores the importance of introducing ecosystem-based adaptation.[93] An important feature of Cape Town's City Resilience Strategy is its explicit alignment with relevant SDGs to facilitate internal monitoring and external reporting, including by means of the city's new Voluntary Local Review process.[94]

While not a city network member, Gothenburg, Sweden's second-largest city and industrial hub, with a population of over 500,000, has developed and implemented many comprehensive sustainability, climate change and resilience policies and programmes. It too faces flood risks in lower-lying central river and canal environs and associated backfill areas, exacerbated by a combination of urbanized hard, impervious surfaces and a soil type that inhibits water infiltration, thus generating runoff. As a Swedish pioneer of climate change action, it undertook thorough studies of vulnerability and risk, including from extreme weather in the first decade of this century. These plans are currently being updated to reflect changing conditions and urban priorities as well as national environmental standards. This work is also being geared to addressing the key challenges of resource consumption and climate change; residential and social segregation between immigrant minorities and the rest of the population; and steering urban growth with the vision of Gothenburg becoming a climate-smart and resilient city with limited environmental impact.[95]

All these reasonably progressive examples, however, have been compiled and are being implemented by means of principally internal top-down and technocratic processes, with limited public engagement or participation, let alone co-production. Levels of citizen awareness, let alone buy-in or senses of shared ownership, are therefore limited, as is the planned role for citizens in implementation. This illustrates one key area in which the important capacity of residents is not yet being adequately mobilized or harnessed, if at all, so that overall resilience is unlikely to be maximized. It is therefore recommended that appropriate training for local government officials and experienced facilitators be utilized as they are often important in bringing together and building common ground among diverse and sometimes historically antagonistic stakeholders.[96] The following section provides some pointers to how this might be successfully addressed in terms of realistic transformative ambitions.

10.6 Final Reflections: Building Resilience for Optimistic Urban Futures

The human impacts on the planet and on the future of human development are now inescapable.[97] The importance of the current context of unprecedented uncertainty and global societal challenges—climate/environmental change, pandemics and epidemics, economic restructuring, human security and the like—cannot be ignored. Yet, exploiting the uncertainty to delay action will only exacerbate the rate, scale, difficulty and cost of subsequent action required to tackle climate change and transform urban areas for sustainability and resilience. Instead, as world leaders reaffirmed at the United Nations Framework Convention on Climate Change summit in Glasgow in November 2021, the time to act, and act decisively, is now.

This urgency applies equally to local governments, and is key to achieving the optimistic urban future first outlined in

Chapter 1. Urban futures can go in any number of directions and the duty of urban actors is to steer our cities toward the most optimistic future, as outlined in the Sustainable Development Goals and the New Urban Agenda. Cities can continue on an unsustainable path of widening income inequality, worsening air quality, continuous urban sprawl, and growing slums and informal settlements that do not provide safe, adequate housing. Or they can change course and chart the path of well-planned, managed, and financed cities that create better becomes for all of their residents, including the most vulnerable.

In pursuit of the optimistic scenario for urban futures, it is helpful to reiterate the key messages of this chapter:

- The global sustainable development agenda, comprising the 2030 Agenda for Sustainable Development, the New Urban Agenda, Sendai Framework for Disaster Risk Reduction, Addis Ababa Action Agenda, and Paris Agreement on Climate Change, provides a coherent framework for integrated, multilevel action that recognizes the importance of subnational entities, particularly local governments, in meeting the challenge. As the lead United Nations agency for human settlements, UN-Habitat's flagship biennial World Cities Report provides dispassionate guidance for decision-makers and planners at all levels based on evidence and lessons from around the world. Following the 2020 Report on the value of sustainable urbanization, the current Report focuses on how to build resilience for sustainable urban futures in the context of the COVID-19 pandemic, accelerating climate and environmental change, inequality and poverty, and armed conflict.

The current Report focuses on how to build resilience for sustainable urban futures in the context of the COVID-19 pandemic, accelerating climate and environmental change, inequality and poverty, and armed conflict

- The COVID-19 pandemic has had profound impacts on urban areas worldwide, with their extent and severity reflecting a complex mixture of socio-cultural and demographic and health characteristics intersecting with inequalities within the built environment. The Omicron variant has demonstrated the ability of new mutations to behave very differently from previous ones, being far more transmissible but, for vaccinated people at least, less virulent. Whether it, together with increasing if still highly unequal vaccination rates, will provide the basis for mass immunity against future variants remains unknown. A high degree of uncertainty in this respect remains.[98] However, the implications of what we already know about COVID's urban epidemiology are clear and reinforce the urgency of concerted action to tackle multidimensional poverty and inequality, and to improve the urban fabric in poor neighbourhoods. Only by tackling the underlying conditions that foster the spread and heighten the impact of COVID-19 and other pandemics and epidemics, will comprehensive urban resilience that incorporates social justice be built. This does not require a dedicated programme in addition to all existing investment programmes. However, it does demand accelerating the pace of transformative actions to increase overall sustainability and resilience substantially.

- Initiatives to build comprehensive urban resilience must therefore be forward-looking, proactive, and inclusive of all stakeholders, including the marginalized and poor. They must also be integrated rather than sectoral or piecemeal. In other words, they should be multisectoral, multidimensional and multi-stakeholder—and about building back differently, not just building back better along the same lines that perpetuate existing inequalities and injustice. As with urban sustainability, this approach is about increasing equity while reducing poverty and injustice.

Although incremental and transformational adaptation are often juxtaposed in a false dichotomy, in practice there is no clear dividing line. Moreover, it is important to acknowledge that if the prevailing balance of political power and vested interests resulted in a failure to make step changes in ambition and practice thus far, this almost certainly reflects self-interest as well as possible resource and capacity constraints. Hence, it is unlikely that transformational adaptation will suddenly become feasible and without substantive reform or realignment of those governance institutions and processes. Moreover, such changes are often complex and slow.

Conversely, substantive gains can be made under broadly existing arrangements, promoted by appropriate champions among officials and elected representatives, without demanding unrealistic institutional reinventions as a prerequisite. This can be achieved through a set of interventions targeting continuous transformational change, which can be grouped as follows:

- provide the basic conditions to enable small steps or wins, which are easier to conceptualize and implement with existing momentum;
- amplify small wins through sense-making, coupling and integrating—activities that explain the changes and their significance in relation to transformational change, linking the changes to cognate ones in other departments or levels of institution, and connecting these changes and experiences to existing institutions so that they benefit and participate in the ongoing transformations; and
- unblock stagnations by confronting social and perceptual obsessions with innovative and counter-intuitive interventions that demonstrate the potential of alternatives, provided that officials and elected representatives are willing to engage critically, learn and adapt procedures and behaviours.[99]

Consistent with this approach and specifically in urban contexts, at least five pathways to urban transformation can be discerned as the basis for formulating and implementing effective climate action (Box 10.4). These pathways are also consistent with key messages of this chapter and this Report as a whole—including the nine pathways to sustainable urban futures framed in Chapter 1, in which the New Urban Agenda provides the integrating framework. They focus on the need for integrated territorial planning and accountable governance with a justice or rights focus to tackle climate change, pandemics, economic insecurity and other societal challenges, coupled with a realistic perspective on how local governance institutions operate (Chapter 1). Two of the five pathways in Box 10.4 focus explicitly on resilience but all contribute to building and enhancing it.[100] The urgency of taking action and building overall urban resilience applies to all the scenarios articulated in Chapters 1 and 2. None avoids the difficult challenges articulated in this chapter.

Box 10.4: Five climate action pathways to urban transformation

Pathway 1: Integrate mitigation and adaptation, as actions that reduce greenhouse gas emissions while integrating increasing resilience are a win-win

Pathway 2: Coordinate disaster risk reduction and climate change adaptation as together these are the cornerstones of resilient cities

Pathway 3: Co-generate risk assessments and climate action plans with the full range of stakeholders and scientists for the most effective outcomes

Pathway 4: Focus on disadvantaged populations as the needs of the most disadvantaged and vulnerable citizens should be addressed at the forefront of climate change planning and action

Pathway 5: Advance governance, finance and knowledge networks as city creditworthiness, developing robust city institutions and participating in city networks all facilitate climate action

Source: Rosenzweig et al, 2018, pp. 607–608; Simon and Solecki, 2018.

Two final observations about the pathways in Box 10.4 are required. The first is to flag the importance of matching more accurate, localized and downscaled risk assessments as per Pathway 3 with appropriate remedial steps and solutions if policymakers and individual citizens are to be engaged actively rather than left despondent. The second is to underscore the urgency of Pathway 4 to prioritize and address the poorest and most vulnerable communities and localities because they are facing the brunt of hazards and risk and are disproportionately experiencing cascades or chains of increasingly frequent and often severe impacts that are compounding the undermining of their assets and resilience (Chapter 3).

These observations also apply to the broader set of pathways in Chapter 1, since they emphasise equity, inclusion, appropriateness and the challenges of matching short and medium to long-term interventions to tackle multidimensional poverty and vulnerability and to promote integrated sustainability and resilience. The prospects for success will be considerably enhanced if cross-party agreement on the vital importance of this objective, so that successive electoral cycles focus on consolidating and building on previous gains instead of changing direction or reversing them.

Endnotes

1. Simon et al, 2018.
2. Elmqvist et al, 2019, p. 268.
3. Pimm et al, 2019, p. 895.
4. World Commission on Environment and Development, 1987.
5. Elmqvist et al, 2019, p. 268. Redundancy refers to having some spare capacity or resources to act as a buffer or safety net.
6. UN-Habitat, 2011b. p. 5; see also Simon et al, 2018.
7. Olsson et al, 2015; Ziervogel et al, 2017; Elmqvist et al, 2019.
8. Olsson et al, 2015; Pimm et al, 2019.
9. IPCC, 2021.
10. UK Environment Agency, 2021.
11. UN-Habitat, 2016a. p. 90; this indicates the close relationship between the two concepts in UN-Habitat's approach. See also Castán Broto and Westman, 2021.
12. UN-Habitat, 2021a. p.16.
13. UN-Habitat 2020a.
14. UN-Habitat, 2021a; McMillan et al, 2021.
15. Huxley et al, 2019.
16. FAO/RUAF, 2015; Leck and Simon 2019; Croese et al, 2020; Simon, 2021
17. World Bank, 2020.
18. Berke et al, 2021.
19. Rockefeller Foundation and Arup, 2018.
20. Valencia et al. 2021, p.3.
21. The member cities are now organized into a legacy organization, the Global Resilient Cities Network, which seeks to co-ordinate and make progress on the urban resilience agenda.
22. Croese et al, 2020, p.7.
23. Croese et al, 2020, p.11.
24. This includes the scenario of having achieved sufficiently high levels of vaccination and/or immunity to permit living with COVID-19.
25. Simon, 2016a; UN-Habitat, 2020a, pp. 96–106, 277–280.
26. UN-Habitat, 2021a. p. 279.
27. Spiliotopoulou and Roseland, 2021.
28. UN-Habitat, 2020a, pp. 94–95.
29. UN-Habitat, 2015a, pp. 17-19.
30. ILO, 2015.
31. City of Gothenburg, 2019.
32. GIZ, 2017; The Hindu, 2021.
33. Anderson et al, 2019.
34. UN-Habitat, 2020a. p. 280.
35. In some countries, this falls under the jurisdiction of regional or national governments.
36. UN-Habitat, 2007, p. 203.
37. UNESCO, 2016.
38. UN-Habitat, 2020a.
39. UN-Habitat, 2020a, pp. 299–301; De Groot and Lemanski, 2020; Anderson et al, 2021; Glaeser et al, 2021; Pieterse, 2021; Simon et al, 2021a; Sverdlik and Walnycki, 2021; UN-Habitat, 2021a, pp. 61–62, 163–164; World Economic Forum, 2021.
40. UN-Habitat, 2015a, pp. 14–16.
41. Cinderby et al, 2021.
42. Simon, 2016; Reckien et al, 2016, 2020; Castán Broto and Westman, 2021.
43. UN-Habitat, 2021a, p. xv.
44. Alberti et al, 2018.
45. Simon, 2016b; Tozer et al, 2020; Frantzeskaki and McPhearson, 2021; McPhearson et al, 2018.
46. Simon, 2016b, Ziervogel et al, 2017; Reckien et al, 2018; Saldarriaga et al, 2020; Tozer et al, 2020; Pauleit et al, 2021.
47. Cobbinah and Nyame, 2021.
48. Quian et al, 2015.
49. Wu et al, 2019; Alexandra, 2019; Saldarriaga et al, 2020.
50. It should be noted that some sources include blue—and sometimes also grey—infrastructure under the umbrella of green infrastructure, Pauleit et al, 2021.
51. McPhearson et al, 2018.
52. Pauleit et al, 2021.
53. Acuto, 2016.
54. Simon et al, 2021, pp. 405–409; Smit et al, 2021.
55. Pauleit et al, 2021, pp. 108–110; Simon et al, 2021.
56. UN-Habitat, 2009, p. 118.
57. RCN and ARUP, 2021; see also Roberts, 2018.
58. IEA, 2021; Jacobson, 2021.
59. WWF, 2020.
60. Huxley et al, 2019; Fraser et al, 2022.
61. Marcotullio et al, 2018.
62. Collaço et al, 2019a, 2019b; Lampis et al, 2021.
63. ICLEI, 2021.
64. Samarakoon et al, 2022.
65. Valencia et al, 2021, pp. 17, 20–21.
66. UN-Habitat, 2018a. UN-Habitat, 2020a.
67. Hemström et al, 2021; Sheikh and Bhaduri, 2021.
68. SDI and Know Your City, 2018–2021.
69. Simon et al, 2021.
70. Simon, 2013, p. 209.
71. UN-Habitat, 2007, p. 38.
72. Castán Broto and Westman, 2021.
73. United Nations, 2017. paras. 9, 15, 29, 42, 75, 81, 90–91.
74. Graute, 2016; Leck and Simon 2018; Romero-Lankao et al, 2018a; Bulkeley, 2019; Croese et al, 2020; Simon 2021; UN-Habitat, 2021a., pp. 127–155.
75. Hausknost et al, 2018; Castán Broto and Westman, 2020; Restrepo-Mieth, 2021.
76. Burch et al, 2018; Romero-Lankao et al, 2018b; UN-Habitat, 2018a.; Paller, 2021; Restrepo-Mieth, 2021.
77. Cucca and Ranci, 2021.
78. Parnell, 2020; UN-Habitat, 2021a. pp. 138–153.
79. Alberti et al, 2018; UN-Habitat, 2020a.
80. UN-Habitat, 2020a. pp.183–184.
81. UN-Habitat, 2020a. pp.192-198; Cities Today, 2021.
82. Burch and DiBella, 2021.
83. UN-Habitat, 2018a. UN-Habitat, 2020a. Effat et al, 2021.
84. UN-Habitat, 2015a. Berke et al, 2021; Simon, 2021.
85. Cartwright et al, 2012; Scott et al, 2019.
86. Raven et al, 2018; UN-Habitat, 2018a. Effat et al, 2021.
87. Raven et al, 2018, pp. 141–144, 147–162; C40 and Arup, 2021.
88. These two categories together are often referred to as comprising embodied emissions.
89. Pomponi et al, 2021; Saint and Pomponi, 2021.
90. UN-Habitat, 2009, p.126.
91. Croese et al, 2020; Valencia et al, 2021, pp. 7–11.
92. Gobierno de la Ciudad de Buenos Aires 2018; Valencia et al, 2021, pp. 7–9.
93. Valencia et al, 2021, pp. 9–11.
94. Croese et al, 2020, Table A1, pp. 12–14.
95. Göteborgs Stad, 2020; Valencia et al, 2021, pp. 11–15.
96. Hemström et al, 2021 pp. 31–47.
97. UNDP, 2020.
98. See, for example, the UN Secretary-General's statement on the International Day of Epidemic Preparedness: https://www.un.org/en/observances/epidemic-preparedness-day/messages.
99. Leck and Roberts, 2015; Termeer et al, 2017, pp.562-570; Romero-Lankao et al, 2018b; Simon and Solecki, 2018; Perry and Russell, 2020; Patterson et al, 2021.
100. Rosenzweig et al, 2018, pp.xx, 607-8; Valencia et al, 2021, pp.3-4.

Statistical Annex

General Disclaimer: The designations employed and presentation of the data in the Statistical Annex do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

Table A.1: Urban Population Size and Rate of Change

	Urban Population at Mid-Year by Country, 2015-2035 (thousands)					Average Annual Rate of Change of the Urban Population by Country, 2015-2035 (per cent)				Percentage of Population at Mid-Year Residing in Urban Country and Area, 2015-2035					Average Annual Rate of Change of the Percentage Urban by Country, 2015-2035 (per cent)			
Region, subregion, country or area	2015	2020	2025	2030	2035	2015-2020	2020-2025	2025-2030	2030-2035	2015	2020	2025	2030	2035	2015-2020	2020-2025	2025-2030	2030-2035
WORLD	**3,981,498**	**4,378,994**	**4,774,646**	**5,167,258**	**5,555,833**	**1.90**	**1.73**	**1.58**	**1.45**	**53.9**	**56.2**	**58.3**	**60.4**	**62.5**	**0.82**	**0.75**	**0.71**	**0.67**
More developed regions	979,089	1,003,640	1,027,097	1,049,699	1,070,804	0.50	0.46	0.44	0.40	78.1	79.1	80.2	81.4	82.7	0.24	0.27	0.30	0.32
Less developed regions	3,002,409	3,375,354	3,747,549	4,117,558	4,485,029	2.34	2.09	1.88	1.71	49.0	51.7	54.3	56.7	59.0	1.09	0.97	0.88	0.80
Least developed countries	305,951	372,038	449,498	538,529	639,204	3.91	3.78	3.61	3.43	32.0	34.6	37.4	40.4	43.4	1.60	1.56	1.50	1.43
Less developed regions, excluding least developed countries	2,696,458	3,003,315	3,298,051	3,579,029	3,845,826	2.16	1.87	1.64	1.44	52.1	55.1	57.8	60.4	62.8	1.10	0.97	0.87	0.79
Less developed regions, excluding China	2,201,145	2,473,276	2,763,104	3,071,076	3,396,290	2.33	2.22	2.11	2.01	46.8	48.8	50.9	53.1	55.4	0.82	0.83	0.85	0.86
High-income countries	955,213	988,586	1,019,399	1,048,879	1,075,813	0.69	0.61	0.57	0.51	80.9	81.9	82.8	83.9	85.0	0.22	0.24	0.26	0.27
Middle-income countries	2,825,252	3,144,887	3,456,425	3,756,587	4,045,091	2.14	1.89	1.67	1.48	50.8	53.7	56.5	59.0	61.5	1.11	0.99	0.90	0.82
Upper-middle-income countries	1,659,611	1,821,036	1,957,223	2,068,825	2,157,098	1.86	1.44	1.11	0.84	64.1	68.2	71.7	74.8	77.3	1.23	1.01	0.82	0.66
Lower-middle-income countries	1,165,641	1,323,851	1,499,202	1,687,762	1,887,993	2.55	2.49	2.37	2.24	39.2	41.6	44.2	47.0	49.9	1.16	1.20	1.22	1.21
Low-income countries	198,536	242,877	296,030	358,848	431,837	4.03	3.96	3.85	3.70	30.9	33.2	35.7	38.3	41.2	1.40	1.44	1.45	1.44
Sub-Saharan Africa	375,827	458,670	555,123	666,165	792,225	3.98	3.82	3.65	3.47	38.8	41.4	44.2	47.0	49.8	1.33	1.28	1.22	1.15
AFRICA	**491,531**	**587,738**	**698,149**	**824,014**	**966,330**	**3.58**	**3.44**	**3.32**	**3.19**	**41.2**	**43.5**	**45.9**	**48.4**	**50.9**	**1.09**	**1.08**	**1.06**	**1.04**
Eastern Africa	**106,096**	**132,520**	**164,482**	**202,579**	**247,131**	**4.45**	**4.32**	**4.17**	**3.98**	**26.6**	**29.0**	**31.6**	**34.5**	**37.5**	**1.74**	**1.75**	**1.74**	**1.69**
Burundi	1,232	1,637	2,147	2,780	3,569	5.68	5.43	5.17	4.99	12.1	13.7	15.5	17.6	19.9	2.53	2.51	2.48	2.42
Comoros	221	255	296	345	401	2.87	2.97	3.06	3.00	28.5	29.4	30.7	32.5	34.6	0.63	0.89	1.14	1.21
Djibouti	718	781	844	906	965	1.67	1.56	1.42	1.27	77.4	78.1	78.9	80.0	81.2	0.17	0.22	0.26	0.30
Eritrea	1,852	2,246	2,699	3,210	3,782	3.86	3.67	3.47	3.28	38.2	41.3	44.6	47.8	51.0	1.58	1.50	1.40	1.29
Ethiopia	19,403	24,463	30,487	37,496	45,488	4.63	4.40	4.14	3.86	19.4	21.7	24.2	26.9	29.7	2.21	2.16	2.11	2.03
Kenya	12,120	14,975	18,372	22,383	27,026	4.23	4.09	3.95	3.77	25.7	28.0	30.6	33.4	36.5	1.74	1.77	1.78	1.75
Madagascar	8,529	10,670	13,200	16,102	19,328	4.48	4.26	3.97	3.65	35.2	38.5	41.9	45.2	48.5	1.81	1.68	1.53	1.37
Malawi	2,867	3,535	4,407	5,551	7,022	4.19	4.41	4.62	4.70	16.3	17.4	18.9	20.9	23.3	1.32	1.66	1.96	2.20
Mauritius	516	519	527	539	554	0.11	0.28	0.45	0.56	41.0	40.8	41.0	41.9	43.2	- 0.12	0.14	0.39	0.63
Mayotte	113	125	139	157	179	2.05	2.19	2.41	2.62	47.0	45.8	45.3	45.7	47.0	- 0.53	- 0.18	0.18	0.53
Mozambique	9,636	11,978	14,811	18,195	22,168	4.35	4.24	4.12	3.95	34.4	37.1	39.9	42.9	46.0	1.50	1.47	1.44	1.39
Réunion	858	893	927	956	980	0.82	0.73	0.62	0.50	99.3	99.7	99.8	99.9	99.9	0.06	0.03	0.01	0.00
Rwanda	1,977	2,281	2,660	3,144	3,769	2.86	3.07	3.34	3.63	17.0	17.4	18.3	19.6	21.5	0.50	0.96	1.40	1.82
Seychelles	52	55	58	61	63	1.26	0.99	0.81	0.70	55.4	57.5	59.7	61.7	63.8	0.76	0.72	0.69	0.65
Somalia	6,015	7,431	9,169	11,229	13,626	4.23	4.20	4.05	3.87	43.2	46.1	49.1	52.1	55.2	1.30	1.25	1.20	1.13
South Sudan	2,240	2,749	3,378	4,164	5,137	4.10	4.12	4.18	4.20	18.9	20.2	21.9	24.1	26.8	1.38	1.66	1.90	2.08
Uganda	8,856	11,775	15,431	19,914	25,273	5.70	5.41	5.10	4.77	22.1	25.0	28.0	31.2	34.4	2.47	2.31	2.15	1.98
United Republic of Tanzania	17,035	22,113	28,245	35,529	44,001	5.22	4.89	4.59	4.28	31.6	35.2	38.9	42.4	45.9	2.16	1.96	1.76	1.56
Zambia	6,747	8,336	10,257	12,549	15,220	4.23	4.15	4.03	3.86	41.9	44.6	47.5	50.5	53.5	1.26	1.25	1.22	1.17
Zimbabwe	5,109	5,700	6,430	7,370	8,581	2.19	2.41	2.73	3.04	32.4	32.2	32.9	34.2	36.4	- 0.09	0.38	0.83	1.24
Middle Africa	**73,632**	**90,619**	**110,579**	**133,728**	**160,150**	**4.15**	**3.98**	**3.80**	**3.61**	**47.9**	**50.6**	**53.4**	**56.2**	**59.0**	**1.11**	**1.07**	**1.03**	**0.97**
Angola	17,676	21,937	26,848	32,437	38,691	4.32	4.04	3.78	3.53	63.4	66.8	69.9	72.5	74.9	1.04	0.89	0.75	0.64
Cameroon	12,463	14,942	17,740	20,857	24,291	3.63	3.43	3.24	3.05	54.6	57.6	60.5	63.2	65.9	1.06	0.98	0.90	0.81
Central African Republic	1,831	2,077	2,452	2,918	3,455	2.52	3.32	3.48	3.38	40.3	42.2	44.7	47.6	50.8	0.93	1.14	1.29	1.29
Chad	3,154	3,830	4,701	5,819	7,246	3.88	4.10	4.27	4.39	22.5	23.5	25.0	27.1	29.8	0.87	1.25	1.60	1.89
Congo	3,274	3,857	4,524	5,290	6,156	3.28	3.19	3.13	3.03	65.5	67.8	70.1	72.3	74.4	0.69	0.65	0.62	0.57
Democratic Republic of the Congo	32,567	40,848	50,723	62,343	75,773	4.53	4.33	4.13	3.90	42.7	45.6	48.7	51.8	54.8	1.31	1.29	1.23	1.16
Equatorial Guinea	830	1,028	1,232	1,445	1,660	4.28	3.62	3.18	2.78	70.6	73.1	75.3	77.2	78.9	0.69	0.59	0.50	0.43
Gabon	1,701	1,938	2,171	2,403	2,636	2.61	2.27	2.03	1.85	88.1	90.1	91.6	92.7	93.5	0.44	0.33	0.24	0.17
Sao Tome and Principe	137	162	188	215	242	3.33	2.96	2.67	2.38	70.2	74.4	77.6	80.0	81.8	1.16	0.85	0.62	0.44
Northern Africa	**115,705**	**129,068**	**143,026**	**157,849**	**174,104**	**2.19**	**2.05**	**1.97**	**1.96**	**51.4**	**52.5**	**53.8**	**55.3**	**57.2**	**0.41**	**0.49**	**0.58**	**0.66**
Algeria	28,248	31,951	35,292	38,232	40,882	2.46	1.99	1.60	1.34	70.8	73.7	76.2	78.3	80.0	0.80	0.66	0.54	0.44
Egypt	40,123	44,041	48,427	53,613	59,988	1.86	1.90	2.03	2.25	42.8	42.8	43.4	44.8	46.8	- 0.00	0.31	0.60	0.87
Libya	4,942	5,376	5,780	6,140	6,460	1.68	1.45	1.21	1.02	79.3	80.7	82.2	83.6	85.0	0.36	0.37	0.34	0.32
Morocco	21,164	23,552	25,869	28,069	30,127	2.14	1.88	1.63	1.42	60.8	63.5	66.2	68.7	71.0	0.88	0.81	0.75	0.68
Sudan	13,099	15,349	18,220	21,775	26,089	3.17	3.43	3.56	3.62	33.9	35.3	37.2	39.7	42.8	0.79	1.07	1.31	1.49
Tunisia	7,672	8,281	8,854	9,372	9,848	1.53	1.34	1.14	0.99	68.1	69.6	71.2	73.0	74.8	0.44	0.47	0.49	0.50

Table A.1: Continued

Region, subregion, country or area	Urban Population at Mid-Year by Country, 2015-2035 (thousands)					Average Annual Rate of Change of the Urban Population by Country, 2015-2035 (per cent)				Percentage of Population at Mid-Year Residing in Urban Country and Area, 2015-2035					Average Annual Rate of Change of the Percentage Urban by Country, 2015-2035 (per cent)			
	2015	2020	2025	2030	2035	2015-2020	2020-2025	2025-2030	2030-2035	2015	2020	2025	2030	2035	2015-2020	2020-2025	2025-2030	2030-2035
Western Sahara	455	519	583	647	710	2.61	2.34	2.08	1.86	86.5	86.8	87.3	87.8	88.5	0.07	0.10	0.13	0.15
Southern Africa	**39,358**	**43,688**	**47,900**	**51,909**	**55,758**	**2.09**	**1.84**	**1.61**	**1.43**	**62.1**	**64.6**	**67.1**	**69.4**	**71.6**	**0.81**	**0.75**	**0.68**	**0.61**
Botswana	1,484	1,712	1,937	2,151	2,353	2.87	2.47	2.10	1.79	67.2	70.9	74.1	76.8	79.1	1.08	0.89	0.72	0.59
Lesotho	585	674	774	887	1,014	2.83	2.77	2.71	2.69	26.9	29.0	31.4	34.0	36.9	1.52	1.56	1.60	1.61
Namibia	1,138	1,403	1,684	1,972	2,261	4.20	3.64	3.16	2.74	46.9	52.0	56.7	60.8	64.2	2.08	1.71	1.39	1.11
South Africa	35,844	39,551	43,113	46,457	49,631	1.97	1.72	1.49	1.32	64.8	67.4	69.8	72.1	74.2	0.76	0.71	0.65	0.59
Swaziland	307	348	393	442	498	2.48	2.42	2.38	2.37	23.3	24.2	25.2	26.5	28.1	0.73	0.87	1.00	1.11
Western Africa	**156,740**	**191,842**	**232,162**	**277,949**	**329,187**	**4.04**	**3.82**	**3.60**	**3.38**	**44.5**	**47.7**	**50.7**	**53.6**	**56.3**	**1.39**	**1.25**	**1.11**	**0.98**
Benin	4,833	5,869	7,076	8,461	10,024	3.89	3.74	3.57	3.39	45.7	48.4	51.2	54.1	57.1	1.16	1.13	1.10	1.05
Burkina Faso	4,986	6,398	8,113	10,163	12,559	4.99	4.75	4.51	4.23	27.5	30.6	33.8	37.1	40.4	2.12	1.99	1.86	1.72
Cabo Verde	343	378	414	450	484	1.97	1.83	1.65	1.45	64.3	66.7	68.8	70.9	72.7	0.72	0.64	0.58	0.52
Côte d'Ivoire	11,426	13,532	16,022	18,912	22,231	3.38	3.38	3.32	3.23	49.4	51.7	54.1	56.7	59.4	0.89	0.92	0.93	0.93
Gambia	1,171	1,435	1,731	2,055	2,403	4.07	3.75	3.43	3.12	59.2	62.6	65.7	68.5	71.0	1.10	0.97	0.84	0.72
Ghana	14,918	17,626	20,539	23,641	26,912	3.34	3.06	2.81	2.59	54.1	57.3	60.5	63.4	66.1	1.17	1.06	0.95	0.83
Guinea	4,249	5,071	6,083	7,300	8,744	3.54	3.64	3.65	3.61	35.1	36.9	39.0	41.4	44.2	0.96	1.10	1.22	1.30
Guinea-Bissau	746	884	1,038	1,209	1,397	3.41	3.22	3.03	2.89	42.1	44.2	46.3	48.5	50.7	0.96	0.94	0.91	0.89
Liberia	2,242	2,659	3,150	3,722	4,372	3.41	3.39	3.33	3.22	49.8	52.1	54.6	57.3	60.1	0.89	0.94	0.97	0.96
Mali	6,986	8,907	11,191	13,850	16,846	4.86	4.57	4.26	3.92	40.0	43.9	47.7	51.2	54.4	1.87	1.64	1.42	1.21
Mauritania	2,137	2,647	3,207	3,808	4,444	4.28	3.84	3.44	3.09	51.1	55.3	59.2	62.7	65.7	1.59	1.35	1.14	0.94
Niger	3,233	4,003	5,068	6,542	8,581	4.27	4.72	5.11	5.43	16.2	16.6	17.4	18.7	20.5	0.46	0.94	1.40	1.84
Nigeria	86,673	107,113	130,312	156,300	184,888	4.23	3.92	3.64	3.36	47.8	52.0	55.8	59.2	62.2	1.65	1.41	1.19	0.99
Saint Helena	2	2	2	2	2	0.73	0.98	1.12	1.06	39.5	40.1	41.1	42.7	44.8	0.27	0.52	0.75	0.95
Senegal	6,869	8,277	9,904	11,778	13,929	3.73	3.59	3.47	3.35	45.9	48.1	50.6	53.2	56.0	0.96	1.00	1.02	1.02
Sierra Leone	2,955	3,454	4,017	4,651	5,351	3.12	3.02	2.93	2.81	40.8	42.9	45.3	47.8	50.6	1.00	1.06	1.11	1.13
Togo	2,974	3,588	4,296	5,106	6,021	3.76	3.60	3.46	3.30	40.1	42.8	45.6	48.6	51.6	1.30	1.29	1.26	1.21
ASIA	**2,119,873**	**2,361,464**	**2,589,655**	**2,802,262**	**2,998,511**	**2.16**	**1.84**	**1.58**	**1.35**	**48.0**	**51.1**	**54.0**	**56.7**	**59.2**	**1.26**	**1.10**	**0.98**	**0.88**
Eastern Asia	**977,010**	**1,078,435**	**1,160,857**	**1,222,479**	**1,263,838**	**1.98**	**1.47**	**1.03**	**0.67**	**59.8**	**64.8**	**69.2**	**72.8**	**75.7**	**1.63**	**1.31**	**1.02**	**0.79**
China	775,353	875,076	956,554	1,017,847	1,059,619	2.42	1.78	1.24	0.80	55.5	61.4	66.5	70.6	73.9	2.03	1.58	1.21	0.91
China, Hong Kong SAR	7,246	7,548	7,769	7,987	8,127	0.82	0.58	0.56	0.35	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
China, Macao SAR	601	652	701	746	784	1.63	1.46	1.23	0.99	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
China, Taiwan Province of China	18,064	18,802	19,421	19,902	20,210	0.80	0.65	0.49	0.31	76.9	78.9	80.8	82.4	83.9	0.52	0.46	0.40	0.35
Dem. People's Republic of Korea	15,469	16,120	16,816	17,531	18,220	0.82	0.85	0.83	0.77	61.3	62.4	63.8	65.6	67.6	0.36	0.45	0.54	0.60
Japan	116,944	116,100	114,646	112,710	110,450	- 0.14	- 0.25	- 0.34	- 0.41	91.4	91.8	92.2	92.7	93.2	0.09	0.10	0.10	0.11
Mongolia	2,031	2,203	2,363	2,514	2,666	1.63	1.40	1.24	1.17	68.2	68.7	69.5	70.6	72.1	0.12	0.23	0.33	0.42
Republic of Korea	41,302	41,934	42,587	43,241	43,762	0.30	0.31	0.30	0.24	81.6	81.4	81.6	82.0	82.9	- 0.05	0.03	0.12	0.20
South-Central Asia	**661,808**	**745,069**	**835,323**	**931,437**	**1,032,413**	**2.37**	**2.29**	**2.18**	**2.06**	**35.0**	**37.1**	**39.4**	**42.0**	**44.9**	**1.17**	**1.23**	**1.28**	**1.31**
Central Asia	**33,057**	**35,681**	**38,432**	**41,414**	**44,820**	**1.53**	**1.49**	**1.49**	**1.58**	**48.1**	**48.3**	**49.1**	**50.5**	**52.5**	**0.09**	**0.33**	**0.56**	**0.76**
Kazakhstan	10,151	10,829	11,494	12,186	12,963	1.29	1.19	1.17	1.24	57.2	57.7	58.6	60.0	61.9	0.17	0.32	0.48	0.61
Kyrgyzstan	2,098	2,323	2,574	2,862	3,201	2.03	2.05	2.12	2.24	35.8	36.9	38.6	40.9	43.9	0.59	0.90	1.18	1.40
Tajikistan	2,286	2,606	2,988	3,444	4,009	2.62	2.73	2.85	3.03	26.7	27.5	28.8	30.8	33.3	0.56	0.94	1.30	1.61
Turkmenistan	2,800	3,167	3,541	3,917	4,297	2.46	2.23	2.02	1.85	50.3	52.5	55.1	57.9	60.8	0.86	0.95	1.00	0.97
Uzbekistan	15,720	16,756	17,836	19,005	20,349	1.28	1.25	1.27	1.37	50.8	50.4	50.7	51.8	53.5	- 0.13	0.13	0.40	0.65
Southern Asia	**628,751**	**709,388**	**796,892**	**890,024**	**987,592**	**2.41**	**2.33**	**2.21**	**2.08**	**34.5**	**36.6**	**39.1**	**41.7**	**44.6**	**1.22**	**1.27**	**1.31**	**1.33**
Afghanistan	8,368	9,904	11,705	13,818	16,279	3.37	3.34	3.32	3.28	24.8	26.0	27.6	29.6	32.0	0.96	1.18	1.38	1.55
Bangladesh	55,305	64,815	74,838	84,689	93,958	3.17	2.88	2.47	2.08	34.3	38.2	42.0	45.6	49.0	2.14	1.90	1.67	1.44
Bhutan	305	353	401	444	482	2.98	2.51	2.05	1.64	38.7	42.3	45.6	48.6	51.1	1.80	1.51	1.25	1.02
India	429,069	483,099	542,743	607,342	675,456	2.37	2.33	2.25	2.13	32.8	34.9	37.4	40.1	43.2	1.27	1.36	1.42	1.46
Iran (Islamic Republic of)	58,217	63,421	67,760	71,205	74,092	1.71	1.32	0.99	0.79	73.4	75.9	78.1	80.1	81.9	0.67	0.59	0.51	0.43
Maldives	161	187	210	231	250	2.93	2.34	1.88	1.66	38.5	40.7	42.8	45.0	47.3	1.08	1.04	1.00	0.96
Nepal	5,318	6,226	7,266	8,408	9,623	3.15	3.09	2.92	2.70	18.6	20.6	22.8	25.4	28.1	2.07	2.09	2.09	2.06
Pakistan	68,227	77,438	87,777	99,360	112,484	2.53	2.51	2.48	2.48	36.0	37.2	38.7	40.7	43.1	0.62	0.81	0.99	1.15
Sri Lanka	3,781	3,945	4,193	4,528	4,967	0.85	1.22	1.54	1.85	18.3	18.7	19.6	21.1	23.1	0.49	0.97	1.42	1.83
South-Eastern Asia	**299,412**	**334,419**	**369,699**	**404,497**	**438,119**	**2.21**	**2.01**	**1.80**	**1.60**	**47.2**	**50.0**	**52.8**	**55.6**	**58.3**	**1.16**	**1.09**	**1.03**	**0.96**
Brunei Darussalam	320	348	374	397	417	1.66	1.44	1.21	1.00	76.7	78.3	79.7	81.1	82.4	0.41	0.37	0.34	0.31
Cambodia	3,443	4,050	4,721	5,458	6,272	3.25	3.06	2.90	2.78	22.2	24.2	26.5	29.0	31.8	1.76	1.80	1.82	1.82
Indonesia	137,635	154,189	170,361	185,755	200,062	2.27	1.99	1.73	1.48	53.3	56.6	59.8	62.8	65.6	1.21	1.09	0.98	0.87
Lao People's Democratic Republic	2,206	2,600	3,019	3,452	3,889	3.28	2.99	2.68	2.38	33.1	36.3	39.6	42.9	46.2	1.84	1.73	1.61	1.49
Malaysia	22,801	25,362	27,845	30,109	32,067	2.13	1.87	1.56	1.26	74.2	77.2	79.7	81.8	83.5	0.78	0.64	0.52	0.43
Myanmar	15,647	17,068	18,722	20,615	22,714	1.74	1.85	1.93	1.94	29.9	31.1	32.8	35.0	37.6	0.84	1.07	1.26	1.43
Philippines	47,078	52,009	57,606	63,844	70,692	1.99	2.04	2.06	2.04	46.3	47.4	49.0	50.9	53.3	0.48	0.64	0.79	0.91
Singapore	5,535	5,935	6,157	6,342	6,480	1.39	0.74	0.59	0.43	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Thailand	32,746	35,698	38,344	40,676	42,609	1.73	1.43	1.18	0.93	47.7	51.4	55.0	58.4	61.6	1.51	1.35	1.20	1.05

Table A.1: Continued

Region, subregion, country or area	Urban Population at Mid-Year by Country, 2015-2035 (thousands)					Average Annual Rate of Change of the Urban Population by Country, 2015-2035 (per cent)				Percentage of Population at Mid-Year Residing in Urban Country and Area, 2015-2035					Average Annual Rate of Change of the Percentage Urban by Country, 2015-2035 (per cent)			
	2015	2020	2025	2030	2035	2015-2020	2020-2025	2025-2030	2030-2035	2015	2020	2025	2030	2035	2015-2020	2020-2025	2025-2030	2030-2035
Timor-Leste	366	433	511	600	701	3.35	3.31	3.23	3.10	29.5	31.3	33.2	35.2	37.3	1.20	1.18	1.16	1.14
Viet Nam	31,635	36,727	42,039	47,248	52,216	2.98	2.70	2.34	2.00	33.8	37.3	40.9	44.5	47.9	1.99	1.83	1.66	1.50
Western Asia	**181,644**	**203,541**	**223,776**	**243,848**	**264,141**	**2.28**	**1.90**	**1.72**	**1.60**	**70.4**	**72.3**	**73.8**	**75.4**	**76.9**	**0.55**	**0.41**	**0.42**	**0.41**
Armenia	1,840	1,861	1,882	1,906	1,934	0.22	0.23	0.25	0.30	63.1	63.3	64.1	65.5	67.5	0.07	0.26	0.43	0.58
Azerbaijan	5,262	5,696	6,101	6,491	6,883	1.58	1.38	1.24	1.17	54.7	56.4	58.4	60.8	63.4	0.61	0.71	0.79	0.84
Bahrain	1,221	1,520	1,679	1,828	1,941	4.38	1.99	1.71	1.20	89.0	89.5	90.1	90.8	91.5	0.11	0.14	0.15	0.14
Cyprus	777	807	838	873	912	0.75	0.76	0.81	0.87	66.9	66.8	67.2	68.1	69.4	- 0.04	0.11	0.26	0.39
Georgia	2,270	2,318	2,359	2,394	2,426	0.42	0.35	0.30	0.26	57.4	59.5	61.6	63.9	66.2	0.69	0.71	0.72	0.72
Iraq	25,252	29,423	34,039	39,208	44,985	3.06	2.91	2.83	2.75	69.9	70.9	72.1	73.6	75.2	0.28	0.34	0.40	0.44
Israel	7,434	8,068	8,698	9,337	9,994	1.64	1.51	1.42	1.36	92.2	92.6	93.0	93.5	94.0	0.09	0.10	0.10	0.11
Jordan	8,267	9,333	9,802	10,364	11,113	2.43	0.98	1.12	1.39	90.3	91.4	92.4	93.2	93.9	0.26	0.21	0.17	0.14
Kuwait	3,936	4,303	4,603	4,874	5,111	1.78	1.35	1.14	0.95	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Lebanon	5,155	5,353	5,033	4,864	4,875	0.75	- 1.23	- 0.68	0.05	88.1	88.9	89.8	90.6	91.4	0.19	0.19	0.18	0.17
Oman	3,417	4,443	4,990	5,407	5,703	5.25	2.32	1.61	1.07	81.4	86.3	89.5	91.7	93.1	1.18	0.74	0.47	0.30
Qatar	2,455	2,770	3,011	3,217	3,389	2.41	1.66	1.32	1.04	98.9	99.2	99.4	99.5	99.6	0.06	0.04	0.02	0.01
Saudi Arabia	26,249	29,256	31,843	34,143	36,170	2.17	1.69	1.40	1.15	83.2	84.3	85.4	86.5	87.5	0.26	0.26	0.25	0.24
State of Palestine	3,514	4,083	4,708	5,371	6,069	3.00	2.85	2.64	2.44	75.4	76.7	78.2	79.7	81.3	0.36	0.38	0.39	0.39
Syrian Arab Republic	9,774	10,498	13,736	16,423	18,657	1.43	5.38	3.57	2.55	52.2	55.5	58.7	61.7	64.6	1.23	1.12	1.01	0.91
Turkey	57,617	63,803	67,446	70,951	74,481	2.04	1.11	1.01	0.97	73.6	76.1	78.3	80.2	81.9	0.67	0.57	0.49	0.41
United Arab Emirates	7,843	8,542	9,207	9,865	10,492	1.71	1.50	1.38	1.23	85.7	87.0	88.2	89.2	90.1	0.32	0.27	0.23	0.19
Yemen	9,361	11,465	13,802	16,330	19,007	4.06	3.71	3.36	3.04	34.8	37.9	41.1	44.4	47.6	1.72	1.63	1.51	1.40
EUROPE	**547,147**	**556,684**	**565,026**	**572,890**	**580,282**	**0.35**	**0.30**	**0.28**	**0.26**	**73.9**	**74.9**	**76.1**	**77.5**	**79.0**	**0.28**	**0.32**	**0.36**	**0.39**
Eastern Europe	**203,146**	**203,296**	**203,360**	**203,271**	**203,286**	**0.01**	**0.01**	**- 0.01**	**0.00**	**69.3**	**69.9**	**70.9**	**72.2**	**73.9**	**0.18**	**0.28**	**0.37**	**0.45**
Belarus	7,321	7,484	7,590	7,631	7,629	0.44	0.28	0.11	- 0.01	77.2	79.5	81.5	83.3	84.8	0.59	0.50	0.43	0.36
Bulgaria	5,311	5,253	5,179	5,082	4,965	- 0.22	- 0.28	- 0.38	- 0.47	74.0	75.7	77.4	79.0	80.6	0.45	0.44	0.42	0.40
Czechia	7,791	7,875	7,953	8,009	8,052	0.21	0.20	0.14	0.11	73.5	74.1	74.9	76.1	77.4	0.16	0.23	0.30	0.36
Hungary	6,898	6,922	6,938	6,940	6,919	0.07	0.05	0.01	- 0.06	70.5	71.9	73.5	75.1	76.8	0.40	0.43	0.44	0.45
Poland	23,065	22,782	22,598	22,533	22,568	- 0.25	- 0.16	- 0.06	0.03	60.3	60.0	60.5	61.5	63.2	- 0.08	0.14	0.35	0.54
Republic of Moldova	1,728	1,722	1,729	1,749	1,778	- 0.07	0.09	0.23	0.33	42.5	42.8	43.9	45.5	47.8	0.17	0.46	0.74	0.98
Romania	10,711	10,507	10,431	10,456	10,554	- 0.38	- 0.15	0.05	0.19	53.9	54.2	55.1	56.6	58.7	0.11	0.34	0.54	0.72
Russian Federation	106,549	107,486	108,062	108,337	108,569	0.18	0.11	0.05	0.04	74.1	74.8	75.8	77.1	78.6	0.19	0.27	0.34	0.40
Slovakia	2,931	2,931	2,955	2,998	3,054	- 0.00	0.17	0.28	0.37	53.9	53.8	54.3	55.6	57.6	- 0.05	0.22	0.47	0.70
Ukraine	30,841	30,335	29,924	29,537	29,198	- 0.33	- 0.27	- 0.26	- 0.23	69.1	69.6	70.5	71.7	73.2	0.16	0.25	0.34	0.41
Northern Europe	**83,943**	**87,488**	**90,892**	**94,053**	**96,959**	**0.83**	**0.76**	**0.68**	**0.61**	**81.4**	**82.6**	**83.8**	**85.0**	**86.1**	**0.30**	**0.29**	**0.28**	**0.26**
Channel Islands	51	52	54	56	59	0.46	0.68	0.88	1.06	31.0	31.0	31.4	32.2	33.4	0.00	0.26	0.52	0.76
Denmark	4,979	5,108	5,248	5,389	5,516	0.51	0.54	0.53	0.47	87.5	88.1	88.8	89.4	90.2	0.13	0.15	0.15	0.16
Estonia	900	900	899	895	891	0.01	- 0.03	- 0.08	- 0.09	68.4	69.2	70.2	71.4	72.8	0.24	0.29	0.33	0.37
Faeroe Islands	20	21	22	23	25	0.74	0.89	1.05	1.13	41.6	42.4	43.4	44.8	46.4	0.36	0.48	0.60	0.71
Finland	4,672	4,772	4,874	4,970	5,054	0.42	0.42	0.39	0.33	85.2	85.5	86.0	86.6	87.4	0.07	0.11	0.14	0.17
Iceland	309	322	334	345	355	0.81	0.74	0.64	0.54	93.7	93.9	94.1	94.4	94.8	0.04	0.05	0.06	0.07
Ireland	2,939	3,111	3,295	3,484	3,691	1.14	1.15	1.12	1.15	62.5	63.7	65.1	66.8	68.7	0.35	0.44	0.51	0.57
Isle of Man	43	45	48	50	53	0.89	0.97	1.04	1.10	52.2	52.9	54.0	55.4	57.2	0.25	0.39	0.53	0.65
Latvia	1,355	1,293	1,250	1,222	1,197	- 0.93	- 0.68	- 0.46	- 0.40	68.0	68.3	69.0	69.9	71.2	0.10	0.19	0.28	0.36
Lithuania	1,971	1,941	1,929	1,920	1,909	- 0.31	- 0.12	- 0.10	- 0.11	67.2	68.0	69.2	70.6	72.4	0.24	0.33	0.41	0.48
Norway	4,217	4,522	4,830	5,130	5,409	1.40	1.32	1.20	1.06	81.1	83.0	84.6	86.1	87.3	0.46	0.40	0.34	0.29
Sweden	8,451	8,905	9,309	9,669	9,977	1.05	0.89	0.76	0.63	86.6	88.0	89.2	90.3	91.2	0.33	0.28	0.24	0.20
United Kingdom	54,035	56,495	58,799	60,899	62,822	0.89	0.80	0.70	0.62	82.6	83.9	85.1	86.3	87.4	0.31	0.29	0.27	0.25
Southern Europe	**107,618**	**109,342**	**110,832**	**112,280**	**113,554**	**0.32**	**0.27**	**0.26**	**0.23**	**70.6**	**72.1**	**73.8**	**75.4**	**77.2**	**0.43**	**0.44**	**0.45**	**0.45**
Albania	1,679	1,827	1,949	2,038	2,090	1.69	1.29	0.90	0.51	57.4	62.1	66.1	69.5	72.2	1.57	1.25	0.99	0.77
Andorra	69	68	68	69	69	- 0.31	0.11	0.12	0.15	88.3	87.9	87.7	87.8	88.2	- 0.10	- 0.04	0.02	0.08
Bosnia and Herzegovina	1,668	1,715	1,768	1,824	1,876	0.55	0.61	0.62	0.56	47.2	49.0	51.2	53.6	56.2	0.77	0.85	0.92	0.96
Croatia	2,379	2,369	2,375	2,394	2,421	- 0.08	0.05	0.16	0.22	56.2	57.6	59.3	61.5	63.9	0.49	0.61	0.70	0.77
Gibraltar	34	35	36	36	36	0.45	0.28	0.22	0.18	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Greece	8,755	8,850	8,897	8,926	8,940	0.22	0.11	0.06	0.03	78.0	79.7	81.3	82.8	84.1	0.42	0.39	0.36	0.33
Holy See	1	1	1	1	1	- 0.05	0.0	- 0.10	- 0.05	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Italy	41,394	42,007	42,569	43,161	43,722	0.29	0.27	0.28	0.26	69.6	71.0	72.6	74.3	76.0	0.42	0.44	0.45	0.46
Malta	404	412	417	420	418	0.38	0.28	0.11	- 0.08	94.4	94.7	95.1	95.4	95.7	0.07	0.07	0.07	0.07
Montenegro	413	425	435	443	449	0.54	0.45	0.37	0.28	65.8	67.5	69.2	70.9	72.5	0.50	0.49	0.48	0.47
Portugal	6,617	6,776	6,926	7,049	7,135	0.47	0.44	0.35	0.24	63.5	66.3	68.9	71.4	73.6	0.86	0.78	0.69	0.61
San Marino	32	33	34	34	34	0.67	0.41	0.28	0.17	96.7	97.5	98.0	98.4	98.6	0.16	0.11	0.07	0.05
Serbia	4,930	4,913	4,924	4,953	4,993	- 0.07	0.04	0.12	0.16	55.7	56.4	57.6	59.3	61.3	0.27	0.42	0.56	0.68
Slovenia	1,116	1,148	1,179	1,211	1,244	0.56	0.54	0.53	0.53	53.8	55.1	56.8	58.8	61.1	0.49	0.60	0.70	0.77

Table A.1: Continued

Region, subregion, country or area	Urban Population at Mid-Year by Country, 2015-2035 (thousands)					Average Annual Rate of Change of the Urban Population by Country, 2015-2035 (per cent)				Percentage of Population at Mid-Year Residing in Urban Country and Area, 2015-2035					Average Annual Rate of Change of the Percentage Urban by Country, 2015-2035 (per cent)			
	2015	2020	2025	2030	2035	2015-2020	2020-2025	2025-2030	2030-2035	2015	2020	2025	2030	2035	2015-2020	2020-2025	2025-2030	2030-2035
Spain	36,933	37,544	37,996	38,420	38,785	0.33	0.24	0.22	0.19	79.6	80.8	82.1	83.3	84.6	0.30	0.31	0.30	0.30
TFYR Macedonia	1,194	1,221	1,259	1,303	1,342	0.45	0.61	0.69	0.58	57.4	58.5	60.3	62.7	65.4	0.37	0.61	0.80	0.83
Western Europe	**152,441**	**156,558**	**159,942**	**163,286**	**166,483**	**0.53**	**0.43**	**0.41**	**0.39**	**79.4**	**80.2**	**81.2**	**82.2**	**83.4**	**0.21**	**0.24**	**0.26**	**0.28**
Austria	5,009	5,159	5,338	5,531	5,727	0.59	0.68	0.71	0.70	57.7	58.7	60.1	61.8	63.8	0.35	0.46	0.56	0.64
Belgium	11,048	11,397	11,614	11,811	11,984	0.62	0.38	0.34	0.29	97.9	98.1	98.3	98.4	98.6	0.04	0.04	0.03	0.03
France	51,343	53,218	55,019	56,789	58,489	0.72	0.67	0.63	0.59	79.7	81.0	82.3	83.6	84.9	0.33	0.33	0.32	0.31
Germany	63,078	63,930	64,346	64,871	65,466	0.27	0.13	0.16	0.18	77.2	77.5	78.0	78.9	80.1	0.07	0.15	0.23	0.29
Liechtenstein	5	6	6	6	7	0.81	1.15	1.44	1.69	14.3	14.4	14.8	15.5	16.5	0.16	0.54	0.91	1.27
Luxembourg	511	552	593	629	663	1.55	1.43	1.17	1.07	90.2	91.5	92.4	93.2	93.8	0.28	0.22	0.17	0.12
Monaco	38	39	40	41	42	0.51	0.50	0.52	0.52	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Netherlands	15,274	15,847	16,319	16,671	16,895	0.74	0.59	0.43	0.27	90.2	92.2	93.7	94.8	95.5	0.45	0.32	0.22	0.15
Switzerland	6,133	6,409	6,668	6,937	7,208	0.88	0.79	0.79	0.77	73.7	73.9	74.5	75.4	76.6	0.05	0.15	0.24	0.32
LATIN AMERICA AND THE CARIBBEAN	**505,392**	**539,427**	**571,254**	**600,480**	**626,673**	**1.30**	**1.15**	**1.00**	**0.85**	**79.9**	**81.2**	**82.4**	**83.6**	**84.7**	**0.31**	**0.30**	**0.28**	**0.27**
Caribbean	**30,319**	**32,251**	**34,069**	**35,729**	**37,157**	**1.24**	**1.10**	**0.95**	**0.78**	**70.0**	**72.2**	**74.3**	**76.2**	**78.0**	**0.61**	**0.57**	**0.52**	**0.47**
Anguilla	15	15	16	16	16	0.90	0.47	0.28	0.14	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Antigua and Barbuda	25	26	27	28	30	0.55	0.87	1.15	1.40	25.0	24.4	24.4	24.8	25.7	- 0.46	- 0.06	0.35	0.74
Aruba	45	47	48	50	53	0.67	0.77	0.87	0.89	43.1	43.7	44.7	46.2	48.0	0.27	0.46	0.63	0.79
Bahamas	320	339	356	373	387	1.13	1.02	0.89	0.76	82.7	83.2	83.9	84.7	85.7	0.12	0.16	0.19	0.22
Barbados	89	90	92	95	100	0.20	0.46	0.70	0.93	31.2	31.2	31.7	32.8	34.5	- 0.04	0.32	0.67	1.00
British Virgin Islands	14	16	17	19	20	2.42	1.73	1.52	1.31	46.6	48.5	50.6	52.8	55.0	0.81	0.84	0.85	0.81
Caribbean Netherlands	18	20	21	21	22	1.37	0.88	0.81	0.75	74.8	75.0	75.6	76.5	77.6	0.08	0.16	0.23	0.29
Cayman Islands	60	64	68	71	74	1.27	1.13	1.00	0.87	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Cuba	8,813	8,874	8,957	9,048	9,112	0.14	0.19	0.20	0.14	76.9	77.2	77.8	78.7	79.9	0.08	0.16	0.23	0.29
Curaçao	141	146	150	154	158	0.62	0.57	0.52	0.48	89.4	89.1	89.1	89.3	89.9	- 0.07	- 0.00	0.06	0.12
Dominica	51	53	56	58	59	0.94	0.84	0.67	0.48	69.6	71.1	72.6	74.2	75.7	0.43	0.43	0.42	0.41
Dominican Republic	8,272	9,169	9,950	10,618	11,170	2.06	1.64	1.30	1.01	78.6	82.5	85.5	87.8	89.4	0.99	0.71	0.51	0.37
Grenada	38	40	42	44	46	0.76	0.86	0.87	0.95	36.0	36.5	37.5	38.9	40.7	0.30	0.52	0.72	0.91
Guadeloupe	443	442	441	442	441	- 0.08	- 0.04	0.04	- 0.02	98.4	98.5	98.6	98.7	98.8	0.01	0.02	0.02	0.02
Haiti	5,616	6,492	7,343	8,144	8,870	2.90	2.47	2.07	1.71	52.4	57.1	61.3	64.9	68.0	1.70	1.41	1.16	0.94
Jamaica	1,575	1,640	1,707	1,770	1,827	0.82	0.79	0.73	0.64	54.8	56.3	58.2	60.3	62.8	0.53	0.65	0.74	0.80
Martinique	343	344	344	344	344	0.02	0.03	0.00	- 0.03	89.0	89.1	89.5	90.1	90.8	0.04	0.08	0.13	0.15
Montserrat	0	0	1	1	1	0.64	0.94	1.20	1.52	9.0	9.1	9.4	9.9	10.6	0.16	0.58	0.98	1.38
Puerto Rico	3,439	3,416	3,395	3,376	3,345	- 0.14	- 0.12	- 0.11	- 0.19	93.6	93.6	93.7	94.0	94.4	- 0.01	0.03	0.06	0.09
Saint Kitts and Nevis	17	18	18	20	21	0.92	1.06	1.22	1.37	30.8	30.8	31.4	32.4	34.0	0.01	0.34	0.66	0.96
Saint Lucia	33	34	36	38	40	0.80	0.98	1.14	1.27	18.5	18.8	19.5	20.4	21.6	0.35	0.64	0.92	1.19
Saint Vincent and the Grenadines	56	59	62	64	67	1.03	0.94	0.84	0.75	51.0	53.0	55.2	57.3	59.4	0.80	0.78	0.76	0.73
Sint Maarten (Dutch part)	39	41	44	46	48	1.31	1.16	0.98	0.80	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Trinidad and Tobago	725	733	742	753	768	0.22	0.23	0.30	0.41	53.3	53.2	53.7	54.8	56.5	- 0.04	0.19	0.40	0.60
Turks and Caicos Islands	32	35	37	40	42	1.77	1.46	1.24	1.05	92.2	93.6	94.6	95.3	95.8	0.30	0.21	0.15	0.10
United States Virgin Islands	100	101	100	99	96	0.10	- 0.11	- 0.29	- 0.44	95.4	95.9	96.4	96.8	97.0	0.12	0.10	0.07	0.06
Central America	**127,304**	**138,768**	**149,898**	**160,493**	**170,368**	**1.72**	**1.54**	**1.37**	**1.19**	**73.7**	**75.4**	**76.9**	**78.5**	**80.0**	**0.44**	**0.41**	**0.40**	**0.38**
Belize	163	183	205	230	256	2.32	2.30	2.23	2.17	45.4	46.0	47.1	48.6	50.5	0.27	0.46	0.63	0.78
Costa Rica	3,695	4,074	4,391	4,647	4,846	1.95	1.50	1.14	0.84	76.9	80.8	83.7	85.8	87.3	0.99	0.71	0.50	0.34
El Salvador	4,400	4,759	5,085	5,371	5,595	1.57	1.33	1.09	0.82	69.7	73.4	76.6	79.2	81.2	1.05	0.84	0.66	0.52
Guatemala	8,121	9,284	10,568	11,963	13,452	2.68	2.59	2.48	2.35	50.0	51.8	54.0	56.4	59.1	0.73	0.82	0.88	0.92
Honduras	4,943	5,672	6,421	7,169	7,892	2.75	2.48	2.20	1.92	55.2	58.4	61.4	64.3	67.0	1.13	1.02	0.92	0.82
Mexico	99,813	108,074	115,926	123,198	129,795	1.59	1.40	1.22	1.04	79.3	80.7	82.1	83.5	84.8	0.36	0.35	0.33	0.31
Nicaragua	3,521	3,787	4,071	4,387	4,709	1.45	1.45	1.49	1.41	57.9	59.0	60.5	62.3	64.3	0.38	0.49	0.58	0.66
Panama	2,647	2,935	3,230	3,528	3,824	2.06	1.92	1.77	1.61	66.7	68.4	70.3	72.2	74.2	0.51	0.53	0.55	0.55
South America	**347,768**	**368,409**	**387,288**	**404,258**	**419,148**	**1.15**	**1.00**	**0.86**	**0.72**	**83.5**	**84.6**	**85.6**	**86.5**	**87.5**	**0.25**	**0.24**	**0.23**	**0.22**
Argentina	39,728	41,920	44,010	45,994	47,853	1.07	0.97	0.88	0.79	91.5	92.1	92.7	93.2	93.8	0.13	0.13	0.12	0.11
Bolivia (Plurinational State of)	7,335	8,095	8,887	9,700	10,520	1.97	1.87	1.75	1.62	68.4	70.1	71.9	73.7	75.5	0.50	0.50	0.50	0.49
Brazil	176,654	186,217	194,452	201,296	206,743	1.05	0.87	0.69	0.53	85.8	87.1	88.2	89.3	90.2	0.30	0.27	0.23	0.21
Chile	15,517	16,206	16,850	17,446	17,962	0.87	0.78	0.69	0.58	87.4	87.7	88.2	88.8	89.5	0.08	0.11	0.14	0.16
Colombia	38,469	40,892	43,011	44,804	46,258	1.22	1.01	0.82	0.64	79.8	81.4	82.9	84.3	85.6	0.41	0.37	0.33	0.30
Ecuador	10,235	11,124	12,063	13,049	14,077	1.66	1.62	1.57	1.52	63.4	64.2	65.3	66.7	68.5	0.24	0.34	0.44	0.52
Falkland Islands (Malvinas)	2	2	2	2	2	0.76	0.53	0.34	0.19	76.3	78.5	80.4	82.0	83.4	0.58	0.48	0.40	0.33
French Guiana	227	261	296	334	373	2.78	2.55	2.38	2.21	84.5	85.8	87.0	87.9	88.8	0.31	0.26	0.22	0.19
Guyana	203	212	223	236	250	0.83	1.01	1.12	1.20	26.4	26.8	27.5	28.6	30.0	0.26	0.51	0.76	1.00
Paraguay	4,033	4,394	4,771	5,154	5,538	1.71	1.64	1.55	1.44	60.8	62.2	63.8	65.7	67.7	0.47	0.53	0.58	0.61
Peru	24,272	26,082	27,880	29,643	31,327	1.44	1.33	1.23	1.11	77.4	78.3	79.4	80.5	81.8	0.24	0.27	0.29	0.31
Suriname	365	382	399	417	435	0.90	0.88	0.86	0.83	66.1	66.1	66.7	67.6	69.0	0.03	0.16	0.28	0.39

Table A.1: Continued

Region, subregion, country or area	Urban Population at Mid-Year by Country, 2015-2035 (thousands)					Average Annual Rate of Change of the Urban Population by Country, 2015-2035 (per cent)				Percentage of Population at Mid-Year Residing in Urban Country and Area, 2015-2035					Average Annual Rate of Change of the Percentage Urban by Country, 2015-2035 (per cent)			
	2015	2020	2025	2030	2035	2015-2020	2020-2025	2025-2030	2030-2035	2015	2020	2025	2030	2035	2015-2020	2020-2025	2025-2030	2030-2035
Uruguay	3,262	3,338	3,405	3,461	3,506	0.46	0.40	0.33	0.26	95.0	95.5	95.9	96.3	96.6	0.10	0.09	0.08	0.07
Venezuela (Bolivarian Republic of)	27,465	29,284	31,038	32,722	34,303	1.28	1.16	1.06	0.94	88.2	88.3	88.6	89.0	89.6	0.03	0.07	0.10	0.14
NORTHERN AMERICA	**290,616**	**304,761**	**319,702**	**334,780**	**349,205**	**0.95**	**0.96**	**0.92**	**0.84**	**81.6**	**82.6**	**83.6**	**84.7**	**85.8**	**0.22**	**0.24**	**0.26**	**0.27**
Bermuda	62	61	60	59	58	- 0.44	- 0.20	- 0.26	- 0.36	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Canada	29,212	30,670	32,164	33,663	35,120	0.97	0.95	0.91	0.85	81.3	81.6	82.1	82.9	83.8	0.07	0.13	0.19	0.23
Greenland	49	50	51	51	51	0.42	0.41	0.21	0.02	86.1	87.3	88.4	89.3	90.1	0.28	0.24	0.21	0.19
Saint Pierre and Miquelon	6	6	6	6	6	0.36	0.75	0.75	0.66	89.9	90.0	90.2	90.5	91.0	0.02	0.05	0.08	0.10
United States of America	261,288	273,975	287,421	301,001	313,969	0.95	0.96	0.92	0.84	81.7	82.7	83.7	84.9	86.0	0.24	0.26	0.27	0.27
OCEANIA	**26,938**	**28,919**	**30,860**	**32,831**	**34,832**	**1.42**	**1.30**	**1.24**	**1.18**	**68.1**	**68.2**	**68.5**	**68.9**	**69.4**	**0.03**	**0.07**	**0.11**	**0.16**
Australia/New Zealand	**24,381**	**26,095**	**27,724**	**29,319**	**30,867**	**1.36**	**1.21**	**1.12**	**1.03**	**85.8**	**86.3**	**86.9**	**87.7**	**88.5**	**0.12**	**0.14**	**0.16**	**0.18**
Australia	20,397	21,904	23,335	24,740	26,110	1.43	1.27	1.17	1.08	85.7	86.2	86.9	87.6	88.4	0.13	0.15	0.17	0.18
New Zealand	3,984	4,191	4,388	4,579	4,756	1.01	0.92	0.85	0.76	86.3	86.7	87.2	87.8	88.6	0.08	0.12	0.14	0.17
Melanesia	**1,903**	**2,138**	**2,418**	**2,757**	**3,172**	**2.33**	**2.46**	**2.63**	**2.81**	**19.2**	**19.6**	**20.3**	**21.4**	**22.8**	**0.46**	**0.72**	**1.01**	**1.31**
Fiji	488	529	567	601	632	1.62	1.37	1.17	0.99	54.7	57.2	59.7	62.0	64.1	0.90	0.83	0.76	0.69
New Caledonia	187	205	224	242	259	1.89	1.72	1.56	1.40	69.4	71.5	73.5	75.3	76.9	0.61	0.54	0.48	0.43
Papua New Guinea	1,031	1,168	1,351	1,592	1,909	2.51	2.91	3.28	3.63	13.0	13.3	14.1	15.2	16.8	0.51	1.04	1.55	2.03
Solomon Islands	131	160	191	225	261	3.91	3.57	3.28	3.00	22.4	24.7	26.9	29.1	31.2	1.97	1.76	1.56	1.36
Vanuatu	66	75	85	97	111	2.55	2.55	2.58	2.62	25.0	25.5	26.3	27.4	28.7	0.45	0.62	0.80	0.96
Micronesia	**353**	**375**	**397**	**421**	**443**	**1.21**	**1.18**	**1.14**	**1.03**	**67.9**	**69.2**	**70.4**	**71.5**	**72.6**	**0.37**	**0.33**	**0.31**	**0.30**
Guam	153	160	167	173	178	0.92	0.84	0.72	0.58	94.5	94.9	95.3	95.7	96.0	0.09	0.08	0.07	0.07
Kiribati	58	68	78	88	97	3.19	2.77	2.36	2.02	51.6	55.6	59.1	62.2	64.8	1.48	1.23	1.01	0.82
Marshall Islands	40	41	43	45	48	0.61	0.61	1.09	1.36	75.8	77.8	79.5	81.1	82.4	0.52	0.44	0.38	0.32
Micronesia (Fed. States of)	23	25	27	29	32	1.05	1.52	1.86	1.90	22.5	22.9	23.7	24.9	26.5	0.42	0.70	0.96	1.21
Nauru	11	11	11	11	12	- 0.06	0.18	0.22	0.13	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Northern Mariana Islands	50	51	52	53	53	0.29	0.36	0.35	0.16	91.4	91.8	92.3	92.8	93.3	0.10	0.10	0.11	0.11
Palau	17	18	20	21	22	1.77	1.59	1.36	1.08	78.2	81.0	83.3	85.0	86.4	0.71	0.55	0.43	0.33
Polynesia	**301**	**312**	**321**	**334**	**350**	**0.67**	**0.57**	**0.83**	**0.92**	**44.5**	**44.4**	**44.5**	**45.0**	**45.7**	**- 0.04**	**0.05**	**0.22**	**0.30**
American Samoa	48	49	49	50	51	0.07	0.26	0.37	0.40	87.2	87.2	87.3	87.8	88.5	- 0.02	0.04	0.10	0.16
Cook Islands	13	13	14	14	14	0.37	0.52	0.48	0.40	74.4	75.5	76.6	77.8	79.1	0.29	0.30	0.31	0.32
French Polynesia	171	180	186	195	203	1.01	0.65	0.91	0.87	61.7	62.0	62.6	63.5	64.7	0.09	0.19	0.29	0.39
Niue	1	1	1	1	1	1.69	1.43	1.61	1.34	42.6	46.2	49.5	52.5	55.0	1.64	1.38	1.15	0.95
Samoa	37	36	36	37	39	- 0.47	- 0.03	0.51	1.30	18.9	17.9	17.4	17.3	17.7	- 1.11	- 0.61	- 0.07	0.47
Tokelau	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tonga	25	26	27	29	31	0.71	0.99	1.36	1.67	23.3	23.1	23.3	23.8	24.8	- 0.15	0.15	0.47	0.77
Tuvalu	7	7	8	9	10	2.27	2.08	1.83	1.51	59.7	64.0	67.6	70.5	72.8	1.39	1.09	0.84	0.64
Wallis and Futuna Islands	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: United Nations, Department of Economic and Social Affairs, Population Division (2018). World Urbanization Prospects: The 2018 Revision.

Table B.1: Population (%) living in households with Access to Improved Water, Improved Sanitation and Other Urban Basic Services in Urban Areas, Selected Countries

		Water			Sanitation			Durable housing				Other basic services		
County	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Afghanistan	2011	42.9	85.2	82.9	4.5	77.9	66.1	98.0	53.8	42.7	47.3	94.4	86.8	67.0
Afghanistan	2015	30.4	92.1	74.0	9.9	69.2	55.6	89.6	61.3	29.4	49.8	94.2	93.0	81.8
Albania	2000	97.5	100.0	99.3	94.8	98.4	...	99.5	...	...	67.7	...	...	...
Albania	2005	82.2	99.9	98.7	97.2	99.4	97.7	99.6	97.3	91.6	83.8	83.6	...	70.9
Albania	2009	71.4	99.0	98.0	89.5	99.2	97.5	99.9	98.0	95.6	89.3	96.6	...	86.1
Albania	2018	53.1	99.2	97.8	91.1	99.0	98.4	99.7	99.2	96.7	93.0	98.1	...	90.7
Algeria	2012	76.0	94.6	...	91.7	97.7	91.5	22.6	91.7	97.1	74.6	97.5	99.3	99.8
Angola	2006	43.0	94.9	14.7	1.4	84.0	...	87.8	...	...	...	45.9	66.6	86.3
Angola	2011	62.0	95.9	...	19.3	88.7	...	88.3	85.7	97.8	61.8	92.8	82.9	88.5
Angola	2015	52.0	86.6	58.6	11.7	87.3	60.9	76.9	72.2	98.0	64.5	86.3	66.4	80.3
Argentina	2001	96.6	99.1	...	46.8	99.1	...	95.8	93.5	95.5	85.3	27.6	...	96.4
Argentina	2011	86.3	98.2	...	...	...	...	97.6	...	...	91.5	88.6	88.6	...
Armenia	2000	98.1	98.4	40.9	89.7	90.1	84.3	61.8	...	...	...	...	99.4	90.4
Armenia	2005	99.1	99.5	74.4	93.9	99.0	97.6	75.9	...	...	87.9	45.9	99.9	99.2
Armenia	2010	97.9	99.9	95.1	95.8	98.1	97.0	83.7	98.6	99.2	92.6	93.4	99.8	99.8
Armenia	2016	98.7	100.0	98.5	95.3	96.7	96.2	88.5	93.7	99.8	94.7	98.2	100.0	99.7
Azerbaijan	2006	77.6	97.4	76.4	71.0	92.2	82.0	21.2	93.3	98.8	75.6	67.1	99.7	98.9
Bangladesh	2004	30.2	97.1	...	...	50.1	...	48.1	70.5	95.6	64.1	...	77.8	33.1
Bangladesh	2007	28.8	99.6	...	8.6	61.2	41.1	56.8	80.0	97.5	68.2	57.8	82.9	37.4
Bangladesh	2011	43.4	99.5	95.2	10.9	73.8	46.9	67.0	88.3	98.7	75.1	91.0	90.3	47.5
Bangladesh	2014	29.8	99.6	92.2	10.8	84.4	53.8	66.3	89.8	99.5	75.5	94.5	90.8	47.4
Bangladesh	2019	38.1	99.6	99.2	29.5	90.2	64.5	75.3	66.7	99.6	80.2	97.6	97.2	57.7
Barbados	2012	99.1	99.9	30.2	7.0	98.5	95.1	85.1	90.9	98.2	97.8	94.8	99.1	99.8
Belarus	2005	96.2	99.8	99.6	85.6	99.5	91.2	79.5	99.3	99.9	96.4	64.1	100.0	99.7
Belarus	2012	93.8	99.8	99.8	86.1	99.4	96.3	89.3	99.4	99.2	97.2	95.2	...	99.8
Belize	2006	38.0	99.2	36.1	24.2	96.1	89.9	90.8	88.9	99.4	85.5	72.3	98.4	95.1
Belize	2011	26.3	99.5	99.8	22.7	98.3	92.9	70.7	90.1	98.5	89.2	94.3	96.9	96.5
Belize	2016	21.9	97.3	97.4	19.3	96.8	92.9	74.7	87.3	99.0	89.2	97.6	97.4	95.3
Benin	2001	66.8	78.0	71.6	6.1	35.9	14.4	80.8	62.6	88.7	...	...	51.2	1.8
Benin	2006	61.7	79.4	74.1	0.1	27.2	10.0	78.1	64.4	90.3	69.1	...	54.7	7.3
Benin	2011	62.1	84.1	79.7	...	22.4	...	80.8	74.4	87.0	59.5		66.7	10.7
Benin	2014	55.4	76.8	73.7	0.8	53.0	22.2	82.3	70.6	92.3	66.7	91.8	...	7.0
Benin	2018	47.2	75.6	70.0	...	49.0	22.5	81.1	72.8	94.4	70.3	...	54.2	8.0
Bhutan	2010	99.3	99.6	99.4	11.2	78.5	63.4	98.4	84.1	98.3	73.4	98.4		97.5
Bolivia	2000	91.7	95.9	26.4	68.8	78.4	...	99.2	...	...	63.0	...	...	...
Bolivia	2001	85.8	94.7	...	81.3	81.3	...	...	...	...	63.2	...	...	86.2
Bolivia	2004	89.6	93.2	43.7	56.9	56.9	17.0	85.3	61.9	40.1	62.2	35.8	93.8	90.1
Bolivia	2008	93.8	96.9	29.5	55.2	79.7	56.0	75.1	96.2	97.8	68.6	80.2	97.6	94.1
Bosnia and Herzegovina	2006	92.8	99.6	99.5	80.1	98.5	98.0	94.4	98.5	96.5	97.5	68.6	99.7	81.5
Bosnia and Herzegovina	2012	93.1	99.7	98.8	83.3	99.2	98.6	99.8	98.8	98.9	96.7	95.8	...	56.7
Botswana	2015	96.8	98.2	...	36.3	74.3	...	96.1	92.2	97.7	77.2	...	79.2	71.4
Burkina Faso	2003	86.4	94.2	82.4	8.2	77.8	44.3	93.4	...	...	...	...	53.9	10.1
Burkina Faso	2006	87.6	98.4	...	...	9.5	8.7	96.7	54.6	96.6	79.3	58.7	61.9	14.3
Burkina Faso	2010	78.1	94.7	85.4	1.9	81.9	49.3	86.2	75.8	92.1	76.8	87.3	50.2	14.1
Burkina Faso	2014	79.3	94.0	70.0	1.7	92.3	51.9	83.2	74.7	96.0	76.4	96.9	59.4	25.3
Burkina Faso	2018	76.2	92.4	79.5	...	91.4	52.1	88.6	77.5	98.6	81.3	...	62.4	30.2
Burundi	2005	69.5	79.9	72.3	11.7	47.3	28.5	58.0	72.3	96.3	58.9	35.9	47.6	2.5
Burundi	2010	77.1	86.4	79.6	6.9	74.2	38.1	65.8	83.5	95.2	70.5	76.7	53.4	0.7
Burundi	2012	92.1	97.5	91.8	11.1	92.5	45.6	71.2	83.5	98.9	78.3	83.2	60.8	...
Burundi	2017	89.7	98.4	89.6	3.2	81.0	46.4	72.4	90.0	98.7	80.4	87.2	61.8	0.4
Cambodia	2000	35.0	67.0	24.3	35.8	35.8	30.5	35.5	84.4	...	...	...	62.0	16.0
Cambodia	2004	55.1	64.6	...	75.5	77.9	...	...	...	...	48.2	75.8	83.7	36.1
Cambodia	2010	54.9	94.7	...	41.0	87.9	79.9	91.7	86.4	98.0	54.3	91.9	91.7	49.6
Cambodia	2014	53.5	98.2	...	40.8	92.6	85.2	93.6	89.3	99.1	58.3	97.1	97.3	61.0
Cameroon	2004	67.7	85.5	73.9	15.7	57.2	36.6	75.9	...	...	80.4	46.6	76.9	22.6
Cameroon	2005	68.3	86.5	...	22.3	97.4	...	80.2	84.6	95.1	75.2	...	79.5	29.2
Cameroon	2006	67.6	89.4	...	1.7	51.1	37.7	72.9	...	94.8	80.8	59.3	82.3	24.0
Cameroon	2011	65.2	90.3	75.9	1.5	83.3	55.4	82.1	83.6	94.8	79.6	89.9	87.4	28.2
Cameroon	2014	60.1	94.3	84.8	0.3	83.7	56.0	81.2	83.7	96.4	81.2	96.3	88.3	32.3
Cameroon	2018	54.2	94.8	86.5	2.9	83.7	59.1	84.8	83.4	95.7	77.5	95.4	89.2	37.5
Central African Republic	2000	52.1	88.1	64.4	1.9	23.8	...	37.1	93.4	71.8	99.9	...	19.9	...

Table B.1: Continued

		Water			Sanitation			Durable housing				Other basic services		
County	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Central African Republic	2006	56.6	88.8	65.6	0.7	65.8	42.0	33.5	97.9	74.1	99.8	25.7	25.4	1.1
Central African Republic	2010	50.2	85.3	45.9	0.1	73.4	41.7	35.3	64.5	73.8	97.8	73.6	27.2	0.4
Chad	2000		55.5	59.8	0.9	35.4	...	79.1	...	...	56.6	...	...	...
Chad	2004	44.9	59.6	39.0	7.0	19.5	...	21.3	95.4	82.2	61.9	...	20.2	...
Chad	2010	23.2	52.4	21.4	0.8	15.3	10.5	7.0	53.5	21.8	95.8	46.6	6.4	1.7
Chad	2014	48.7	87.5	67.9	0.0	52.5	27.7	30.3	70.7	79.5	56.8	87.9	36.6	13.2
Colombia	2000	97.8	98.5	59.7	89.0	95.5	79.0	94.5	...	...	82.7	...	99.4	94.4
Colombia	2005	91.9	98.1	31.1	91.0	97.8	12.7	92.8	92.5	...	84.0	...	99.4	95.1
Colombia	2010	91.9	98.3	45.0	90.6	98.0	89.0	61.0	93.4	...	88.4	94.5	99.4	96.5
Colombia	2015	89.7	98.7	61.6	92.9	98.6	92.7	96.0	95.0	...	93.5	97.8	99.8	98.5
Comoros	2012	82.7	97.6	89.5	7.4	52.8	40.4	73.8	83.2	90.5	72.1	88.8	85.2	8.7
Congo	2009	84.1	96.6	...	6.7	76.3	17.9	92.5	71.9	98.4	75.1	91.1	53.3	19.9
Congo	2011	78.8	95.8	78.9	2.5	59.4	17.9	91.0	76.4	99.4	67.7	93.7	58.9	25.5
Congo	2014	68.7	98.6	92.5	23.7	76.0	31.5	94.1	88.6	99.4	100.0	96.9	80.2	39.2
Democratic Republic of the Congo	2000	43.5	66.1	64.4	4.1	57.4	...	99.9	75.4	95.8	35.3	...	...	...
Democratic Republic of the Congo	2007	60.8	80.6	57.9	14.9	53.6	21.4	49.4	...	74.0	...	51.1	38.9	10.8
Democratic Republic of the Congo	2010	61.8	83.1	17.4	0.9	35.9	13.9	55.5	71.4	81.6	61.6	69.9	44.7	8.7
Democratic Republic of the Congo	2014	36.3	84.9	58.9	0.8	56.5	24.4	51.5	67.3	79.5	60.2	82.4	43.2	5.3
Democratic Republic of the Congo	2017	69.7	91.2	77.4	2.0	53.6	19.8	63.7	74.2	86.2	61.5	79.1	57.8	9.8
Costa Rica	2000	98.0	99.1	...	34.7	97.9	...	98.2	...	...	98.6	...	99.2	96.1
Costa Rica	2011	99.5	99.7	99.7	31.5	97.2	95.0	93.7	91.2	97.4	94.7	94.4	99.7	98.8
Costa Rica	2018	99.1	99.8	99.8	28.9	98.6	96.2	97.9	88.5	99.5	97.1	98.3	99.9	...
Cote d'Ivoire	2000	68.5	95.8	79.9	28.1	65.7	...	76.8	...	...	56.2	...	...	...
Cote d'Ivoire	2006	69.3	96.1	16.2	6.2	84.8	40.2	97.3	92.8	97.1	99.2	62.6	88.5	27.9
Cote d'Ivoire	2012	73.3	96.5	92.1	15.0	46.7	...	97.5	...	...	...	94.3	89.7	...
Cote d'Ivoire	2016	74.5	95.0	6.9	11.0	77.1	48.4	98.4	95.3	95.7	100.0	97.4	93.1	53.5
Cuba	2006	82.5	98.3	44.5	52.8	97.1	92.7	...	...	...	...	...	...	...
Cuba	2010	84.6	98.6	91.5	56.7	96.2	92.8	...	...	...	...	...	...	...
Cuba	2014	86.4	98.1	86.6	58.8	95.8	91.6	...	...	...	...	...	...	...
Dominican Republic	2000	34.6	97.5	95.6	74.6	81.0	...	97.9	92.5	99.5	81.0	...	99.4	1.6
Dominican Republic	2002	28.7	98.8	80.2	70.4	89.0	81.9	97.1	94.9	39.3	80.7	...	98.9	95.4
Dominican Republic	2007	18.5	99.4	97.6	78.3	96.1	86.8	98.3	95.7	47.0	86.2	78.2	98.9	95.0
Dominican Republic	2013	7.0	99.2	90.5	82.6	96.5	86.4	98.0	95.3	47.0	86.3	93.4	99.5	93.2
Dominican Republic	2014	6.4	98.4	44.8	27.8	94.7	84.1	98.5	92.5	99.5	88.9	95.0	99.0	95.4
Egypt	2000	98.8	99.7	81.0	55.1	58.8	57.5	95.1	...	...	93.0	...	99.4	95.0
Egypt	2003	99.6	99.9	92.1	63.9	64.9	64.8	96.2	...	...	95.8	...	99.8	98.0
Egypt	2005	98.4	99.9	86.3	67.9	69.5	68.8	97.6	...	...	95.5	40.1	99.7	98.9
Egypt	2008	98.7	100.0	74.0	74.5	75.8	75.3	98.1	...	...	96.4	56.4	99.9	...
Egypt	2014	96.8	99.8	88.3	91.7	99.8	98.9	98.7	...	...	92.2	94.9	99.9	...
El Salvador	2007	91.7	98.1	...	56.1	62.7	...	86.8	92.5	65.9	80.9	69.1	94.9	2.7
El Salvador	2014	68.1	99.2	85.5	53.8	99.0	89.8	91.5	91.3	99.6	82.5	96.8	98.2	91.3
Equatorial Guinea	2000	18.8	60.4	45.8	30.6	92.3	...	82.9	...	...	68.6	...	...	...
Eswatini	2006	86.6	93.3	71.1	49.2	60.4	42.6	97.4	87.8	99.0	78.2	78.1	65.2	69.5
Eswatini	2010	87.7	91.8	91.0	36.1	94.1	50.6	99.0	89.0	99.3	82.0	95.5	...	76.0
Ethiopia	2000	80.3	85.3	57.2	2.4	4.2	2.2	33.6	...	86.8	...	...	77.4	1.7
Ethiopia	2005	89.5	93.5	75.8	1.4	52.3	22.6	54.6	18.1	93.8	49.9	14.5	86.1	2.5
Ethiopia	2011	85.6	94.6	69.8	2.8	45.4	18.4	49.8	19.1	94.1	58.5	67.2	83.7	4.2
Ethiopia	2016	86.8	97.6	59.1	2.8	51.5	20.3	66.5	24.9	93.3	64.4	90.1	92.4	25.9
Fiji	2007	97.2	98.7	...	...	99.6	...	...	73.4	...	87.6	81.9	93.3	...
Fiji	2014	96.9	99.3	...	93.9	99.6	...	...	73.1	...	...	96.5	97.0	46.3
Gabon	2000	92.4	93.4	77.4	31.8	58.7	...	89.9	96.7	99.1	76.1	...	90.8	80.0
Gabon	2012	94.8	97.3	62.5	38.0	64.6	40.9	92.5	99.3	99.7	76.6	97.4	97.8	90.6
Gambia	2000	90.7	94.6	46.1	19.1	47.6	...	81.5	69.9	96.3	75.4	...	51.0	...
Gambia	2006	87.5	91.2	60.0	7.7	93.3	50.7	93.9	75.0	97.6	72.4	74.5	55.2	3.0
Gambia	2010	89.8	94.8	91.2	4.9	90.9	50.5	92.5	77.7	99.3	78.3	97.1	...	1.6
Gambia	2013	83.5	93.7	90.8	2.3	77.1	54.8	67.2	92.9	98.9	65.9	96.7	73.0	0.3
Gambia	2018	84.7	92.2	90.5	2.0	73.9	55.8	95.9	93.3	99.3	81.7	98.7	76.4	1.8
Georgia	2005	91.1	99.0	98.8	80.4	98.7	96.0	98.3	97.3	99.3	89.1	69.6	98.5	81.8
Georgia	2018	93.6	99.3	98.9	89.0	98.6	96.5	97.8	98.8	97.5	94.0	98.7	99.8	98.7
Ghana	2008	67.1	96.4	88.7	3.8	86.7	17.9	95.5	90.5	97.0	65.8	80.4	83.8	23.0
Ghana	2011	46.6	69.6	...	2.9	72.6	18.0	94.1	95.3	82.3	70.3	91.0	81.8	24.2
Ghana	2014	41.5	96.5	86.7	12.9	85.6	20.4	98.1	89.4	98.6	68.8	93.7	90.3	35.2

Table B.1: Continued

		Water			Sanitation			Durable housing				Other basic services		
County	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Ghana	2016	42.6	96.0	89.3	0.9	88.5	22.7	87.7	83.7	98.5	68.4	96.1	89.9	34.0
Ghana	2018	37.6	95.8	94.2	3.8	80.7	24.6	98.2	93.6	98.4	61.6	95.7	89.9	26.9
Ghana	2019	34.8	98.4	95.8	2.8	87.5	23.1	97.4	91.0	99.2	69.9	96.9	93.7	35.2
Guatemala	2002	89.0	96.6	...	69.2	94.4	...	84.6	85.5	98.8	70.8	...	94.5	3.6
Guatemala	2014	49.5	99.4	80.4	73.4	89.9	78.9	86.3	84.8	99.6	73.2	93.6	96.5	62.2
Guinea	2005	66.3	77.9	68.9	7.6	59.9	25.8	90.5	...	...	...	...	63.1	0.6
Guinea	2012	70.2	95.2	74.2	7.5	86.1	39.5	94.1	92.4	96.8	68.9	95.6	75.4	0.6
Guinea	2016	64.3	98.4	46.1	2.7	87.4	43.3	97.3	97.4	97.2	58.8	96.7	83.4	1.6
Guinea	2018	52.9	97.4	82.9	4.6	86.4	44.5	93.6	92.1	96.4	70.5	97.6	86.6	5.7
Guinea Bissau	2000	36.4	71.5	48.0	2.8	11.6	2.3	99.8	92.6	77.5	43.8	...	...	...
Guinea Bissau	2006	45.7	82.3	56.1	12.9	28.8	21.7	75.9	44.6	87.8	55.6	56.7	36.6	2.5
Guinea Bissau	2014	58.7	91.7	71.6	1.6	49.3	25.9	75.9	19.9	96.7	67.3	98.1	35.9	1.4
Guyana	2006	55.1	98.0	97.8	8.7	99.4	89.4	88.2	94.2	99.5	79.7	71.5	81.8	63.4
Guyana	2009	30.4	98.6	71.6	11.7	96.1	90.7	73.2	95.7	96.0	85.4	90.8	90.2	75.9
Guyana	2014	34.0	99.0	48.9	7.4	97.8	91.0	87.7	95.9	99.7	86.4	96.0	93.8	80.7
Haiti	2006	51.9	93.1	81.8	3.0	51.0	27.8	89.6	92.4	99.1	61.0	37.5	69.2	5.7
Haiti	2012	36.3	94.2	85.7	2.0	82.3	38.8	86.5	85.6	93.6	59.3	92.8	72.7	6.1
Haiti	2017	25.3	97.4	91.4	0.6	79.5	47.0	90.5	91.5	96.6	66.2	92.3	76.4	8.7
Honduras	2005	50.6	96.6	46.8	57.0	87.7	77.1	47.0	74.7	99.2	69.5	54.4	...	65.0
Honduras	2012	39.7	98.4	50.5	60.3	91.3	80.1	50.3	76.4	99.0	75.8	93.2	...	68.1
India	2006	69.5	96.1	85.0	28.1	77.1	54.7	80.0	89.3	92.3	53.0	38.0	93.1	59.3
India	2016	67.9	97.7	88.7	22.4	85.3	71.2	84.9	92.7	92.7	63.7	97.2	97.6	79.5
Indonesia	2002	29.3	82.8	72.8	...	83.4	...	86.0	77.3	96.9	...	...	98.0	19.8
Indonesia	2007	28.4	82.1	40.6	...	88.6	77.4	88.7	99.1	98.8	...	...	98.2	21.5
Indonesia	2012	18.4	63.0	39.5	...	90.7	...	91.2	97.6	98.3	84.7	93.6	99.3	73.6
Indonesia	2017	13.8	96.6	95.9	5.1	95.1	...	97.9	95.7	99.6	87.6	96.3	99.0	88.0
Iran	2006	84.0	92.1	...	98.4	98.4	...	32.5	...	...	90.6	...	97.7	91.0
Iraq	2006	90.0	92.4	92.4	34.6	98.2	78.8	98.5	96.0	94.6	49.5	64.8	99.6	92.8
Iraq	2011	69.5	83.5	83.2	38.8	99.2	96.2	98.1	52.5	94.8	54.1	98.9	...	99.8
Iraq	2018	53.8	76.6	...	...	99.6	96.4	98.1	63.5	98.7	99.9	...	...	...
Italy	2001	93.9	99.2	...	...	99.0	...	...	...	...	99.5	...	...	...
Jamaica	2005	85.5	95.9	40.1	10.7	97.2	83.2	...	...	...		...	...	...
Jamaica	2011	88.1	99.2	77.2	14.5	98.6	87.8	88.8	85.9	99.6	90.7	97.6	95.5	89.7
Jordan	2007	71.6	99.7	...	64.6	99.8	96.8	99.9	99.4	...	69.1	93.5	99.0	99.9
Jordan	2009	61.2	99.8	...	67.4	100.0	98.6	100.0	99.8	...	74.8	98.7	99.5	99.8
Jordan	2012	52.3	99.8	...	68.7	99.9	99.7	100.0	99.7	99.0	76.7	99.2	99.5	100.0
Jordan	2018	58.8	99.9	99.6	73.1	99.9	98.2	99.9	99.2	99.1	76.6	98.5	...	99.9
Kazakhstan	2006	90.0	99.4	98.4	60.7	99.5	96.8	96.7	82.3	99.5	93.4	50.7	99.9	91.4
Kazakhstan	2011	92.0	99.4	98.7	63.6	99.8	96.9	97.4	88.5	96.1	100.0	94.4	...	96.8
Kazakhstan	2015	87.4	90.7	...	65.3	99.9	97.6	99.7	93.0	99.5	92.9	98.4	100.0	99.8
Kenya	2003	70.2	77.9	51.5	39.1	50.4	25.7	77.5	...	89.6	66.5	...	51.5	13.3
Kenya	2008	76.8	93.0	75.4	33.9	82.8	35.0	88.2	79.6	96.4	69.9	85.1	64.9	22.8
Kenya	2014	65.9	88.7	70.0	18.2	75.3	30.9	80.2	69.2	97.0	65.7	94.7	65.1	22.6
Kenya	2015	60.4	91.6	65.9	21.1	76.8	38.2	83.0	67.8	95.7	72.7	96.6	72.6	...
Kiribati	2018	59.5	96.3	95.7	18.3	74.2	50.6	67.4	26.2	80.5	45.1	87.1	78.4	16.8
Kyrgyzstan	2012	92.1	96.0	94.5	35.5	98.7	91.7	81.2	72.9	76.6	88.2	97.6	99.8	93.7
Kyrgyzstan	2014	96.3	97.7	...	35.3	99.6	94.6	98.8	71.3	99.2	83.6	99.1	99.9	89.6
Kyrgyzstan	2018	98.0	99.9	99.7	47.7	100.0	96.6	97.2	96.5	98.5	88.7	98.6	...	92.8
Lao People's Democratic Republic	2006	22.2	84.2	83.8	6.8	83.6	79.2	93.5	83.8	93.6	73.2	73.4	93.1	7.5
Lao People's Democratic Republic	2011	19.3	92.6	92.4	1.3	91.3	87.6	93.9	87.8	96.5	80.0	96.9	97.5	11.7
Lao People's Democratic Republic	2017	6.8	96.7	96.6	1.3	94.1	91.2	95.6	91.9	98.9	76.0	98.0	99.5	16.2
Lebanon	2011	53.4	99.9	98.2	91.0	97.8	97.6	99.7	97.6	99.7	72.4	81.9	99.8	99.7
Lesotho	2004	88.6	94.9	79.9	8.4	47.3	24.9	93.1	...	...	...	...	28.7	65.9
Lesotho	2009	82.4	90.7	68.9	3.3	59.6	31.2	95.3	89.6	97.7	73.9	89.1	48.6	73.1
Lesotho	2014	92.8	96.3	81.1	3.7	94.1	49.3	94.0	93.2	97.5	80.4	96.5	65.1	78.5
Lesotho	2018	93.9	98.3	94.4	3.3	87.3	45.9	96.3	95.0	98.1	78.0	97.2	72.0	...
Liberia	2011	14.5	84.6	76.0	1.2	53.2	19.4	84.0	78.1	95.1	52.2	81.7	7.9	0.4
Liberia	2013	5.0	90.2	78.0	1.7	58.2	26.3	76.7	71.7	95.5	60.6	83.8	17.0	0.2
Liberia	2016	14.9	95.1	85.6	2.0	67.7	30.1	81.3	78.1	97.0	60.8	81.4	32.0	0.4
Madagascar	2011	69.2	87.4	...	0.2	21.2	9.2	64.7	68.5	76.9	57.7	73.7	63.7	1.6
Madagascar	2013	54.9	80.9	...	1.3	35.2	14.8	62.3	48.7	74.1	58.4	70.0	60.5	1.8
Madagascar	2016	71.3	87.3	73.6	0.9	32.2	13.0	67.1	69.1	81.8	57.8	73.4	68.2	1.4

Table B.1: Continued

		Water			Sanitation			Durable housing				Other basic services		
County	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Madagascar	2018	53.2	72.5	68.9	1.5	41.2	15.1	74.8	56.1	72.7	55.8	72.1	64.4	1.9
Malawi	2012	69.3	91.9	83.0	14.2	45.1	32.8	69.3	95.0	82.1	73.9	76.7	37.1	10.3
Malawi	2014	84.4	95.9	87.7	14.1	52.2	29.1	78.3	94.0	89.0	77.2	81.3	47.4	9.9
Malawi	2014	88.7	98.6	84.9	2.4	84.9	48.8	76.9	82.9	88.3	98.3	85.6	48.0	10.4
Malawi	2016	86.0	98.2	86.7	2.8	96.0	49.3	76.1	88.1	91.8	86.2	87.8	50.4	11.9
Maldives	2009	56.9	99.3	34.1	99.2	99.9	97.5	98.8	98.4	99.6	61.3	99.6	99.9	99.3
Maldives	2017	27.1	99.6	99.5	98.2	99.8	99.1	99.4	96.4	99.2	64.5	99.0	99.7	99.6
Mali	2012	74.4	94.0	91.2	6.8	86.5	45.3	64.3	70.2	88.0	75.8	95.2	77.3	1.5
Mali	2015	81.3	96.1	92.9	2.4	89.0	57.4	74.2	84.7	93.4	71.4	98.6	85.1	0.8
Mali	2015	77.7	93.5	88.5	3.5	81.9	52.8	74.6	84.6	86.9	100.0	97.8	79.0	2.2
Mali	2018	76.9	95.3	92.4	5.2	85.1	44.8	79.0	84.6	93.2	74.7	97.0	85.7	1.3
Mauritania	2007	46.4	95.2	87.9	2.3	68.1	54.3	73.0	83.1	46.0	48.3	83.8	73.4	60.7
Mauritania	2011	58.0	97.5	85.4	4.3	73.7	53.0	67.3	83.0	82.7	51.1	95.9	79.2	93.5
Mauritania	2015	67.0	97.4	88.7	5.3	74.4	65.6	77.1	79.3	78.0	54.2	96.9	...	64.1
Mexico	2000	94.9	96.7	...	81.4	88.3	...	92.6	94.2	78.0	76.2	...	98.4	93.6
Mexico	2005	95.0	97.9	...	82.7	93.7	...	93.6	...	...	77.6	...	98.1	...
Mexico	2015	17.8	99.7	99.6	91.3	99.0	94.9	98.1	98.0	86.4	84.0	93.2	99.5	...
Moldova	2005	73.3	98.9	...	67.1	91.6	84.7	88.1	99.5	99.1	95.9	57.4	99.5	99.0
Moldova	2012	70.1	95.7	94.4	66.4	95.2	84.5	76.9	98.0	99.8	96.2	89.9	99.8	99.3
Mongolia	2005	40.6	95.6	88.4	32.7	95.4	64.4	19.3	48.2	46.4	51.5	60.2	98.4	36.2
Mongolia	2010	36.0	95.2	89.9	23.6	97.6	64.5	25.8	65.9	27.3	74.8	97.0	96.0	39.4
Mongolia	2013	43.7	91.7	...	32.6	92.7	64.1	44.7	58.0	71.5	86.2	99.4	97.9	63.2
Mongolia	2018	41.0	98.0	94.4	40.8	98.6	78.1	60.1	65.6	74.4	75.1	99.7	99.8	67.7
Montenegro	2005	96.9	97.2	97.2	66.5	98.2	95.5	90.0	95.6	91.6	82.0	79.4	92.7	80.8
Montenegro	2013	92.6	100.0	98.6	63.4	98.3	97.2	96.5	95.3	97.7	91.9	99.0	99.6	66.4
Montenegro	2018	94.5	100.0	99.7	59.7	99.2	98.1	99.8	97.3	99.3	88.6	100.0	99.9	...
Morocco	2004	96.1	98.0	...	98.0	98.6	91.3	92.6	...	...	78.5	...	94.8	99.1
Mozambique	2009	63.2	79.8	...	4.2	54.0	42.4	58.4	68.1	63.8	82.7	60.0	47.7	6.0
Mozambique	2011	71.7	84.8	67.9	0.0	47.4	39.3	57.9	49.0	69.9	78.7	71.8	59.3	9.4
Mozambique	2015	76.5	92.2	84.8	26.0	47.3	40.3	68.9	59.4	79.1	76.0	84.3	73.2	2.8
Mozambique	2018	78.9	89.4	84.2	2.9	69.5	59.5	69.2	71.2	80.2	84.8	87.1	72.2	13.5
Myanmar	2016	11.3	93.3	82.0	0.9	78.9	67.6	54.5	52.3	93.6	67.2	94.2	92.8	57.7
Namibia	2000	97.9	98.1	88.3	78.7	80.6	57.1	86.2	...	...	73.2	...	74.6	73.8
Namibia	2007	96.5	97.4	84.2	73.1	80.2	61.9	83.3	81.8	81.1	77.8	79.5	78.4	76.3
Namibia	2013	96.6	97.9	85.7	63.6	73.8	53.5	78.5	91.1	92.6	80.4	95.9	74.1	72.0
Nepal	2006	47.7	95.7	92.3	20.4	77.0	42.5	68.1	79.1	93.9	67.9	23.6	89.8	43.4
Nepal	2012	53.0	96.3	94.7	26.5	87.8	58.0	76.6	82.6	96.6	81.2	92.8	96.9	64.1
Nepal	2014	61.0	98.5	96.9	24.9	93.7	62.7	80.2	83.6	97.6	84.3	97.7	97.4	76.2
Nepal	2016	50.3	95.9	94.6	11.2	86.3	64.9	50.2	58.5	53.4	83.1	95.8	94.6	44.1
Nicaragua	2001	90.3	95.9	47.0	29.2	71.8	66.9	67.4	61.7	98.9	54.3	11.8	94.3	56.1
Niger	2006	90.8	93.4	84.2	6.9	40.9	24.7	60.1	...	...	51.8	40.5	50.5	3.1
Niger	2012	94.1	97.0	72.1	2.8	77.9	40.2	72.2	40.8	56.7	54.8	84.8	62.7	3.9
Nigeria	2013	15.7	89.8	74.9	8.6	76.9	42.7	85.0	86.0	96.5	66.5	89.1	83.0	4.6
Nigeria	2015	17.1	92.6	84.3	14.3	75.8	48.1	87.4	88.8	93.0	66.7	91.2	82.0	9.1
Nigeria	2016	16.9	91.4	83.4	11.5	77.6	49.4	84.1	89.8	96.3	65.0	91.0	86.3	16.9
Nigeria	2018	14.3	90.9	86.4	6.1	73.8	44.2	85.7	89.6	98.1	66.5	95.6	81.7	22.5
Occupied Palestinian Territory	2010	54.3	99.1	...	62.0	99.5	91.3	99.3	...	...	85.8	20.7	...	99.2
Occupied Palestinian Territory	2014	57.0	98.4	...	62.0	99.7	98.5	99.9	99.3	99.9	73.7	48.7	99.9	97.8
Pakistan	2012	58.9	98.7	85.6	68.6	95.1	87.3	91.9	95.8	92.4	42.2	95.6	99.8	85.2
Pakistan	2014	27.3	87.8	...	40.3	81.6	72.7	82.1	88.3	81.3	54.0	87.2	90.0	69.5
Pakistan	2018	44.5	90.5	87.4	64.9	95.5	88.8	92.0	95.2	92.1	47.4	97.9	99.4	87.8
Panama	2010	96.3	97.8	...	44.4	77.2	73.3	94.3	94.4	89.6	80.7	91.7	97.0	95.0
Panama	2013	98.0	99.9	88.6	45.4	96.0	88.3	95.8	99.9	100.0	86.1	95.8	98.5	...
Papua New Guinea	2018	57.1	83.8	82.4	32.8	62.5	52.4	89.6	70.5	89.2	64.1	90.6	57.1	39.4
Paraguay	2002	68.4	86.6	...	15.8	84.1	...	87.3	78.4	95.8	77.2	44.0	95.4	65.3
Paraguay	2016	71.6	98.6	71.5	14.8	95.7	91.8	93.1	94.6	99.3	87.7	98.4	99.9	82.8
Peru	2004	92.4	95.2	93.6	83.9	89.6	78.6	78.4	74.1	90.7	78.9	...	96.5	74.6
Peru	2007	81.6	90.6	...	...	89.5	...	49.2	84.9	...	86.3	54.3	89.4	73.5
Peru	2012	86.6	95.5	94.5	80.5	89.6	80.0	79.3	70.7	92.2	84.2	92.5	98.4	86.8
Philippines	2003	66.7	98.4	92.1	92.2	93.8	...	73.9	...	...	...	52.2	92.2	...
Philippines	2008	42.9	98.2	89.3	3.5	93.8	75.3	82.3	79.9	95.0	61.9	83.1	93.8	52.2
Philippines	2013	35.5	98.4	92.6	6.9	94.1	73.8	84.3	80.6	95.7	63.2	92.4	94.2	56.0

Table B.1: Continued

		Water			Sanitation			Durable housing				Other basic services		
County	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Philippines	2017	31.2	98.4	97.5	7.0	95.1	79.0	91.8	77.6	97.5	66.7	94.5	96.4	70.3
Rwanda	2010	65.0	89.2	63.7	3.8	88.1	56.3	58.5	69.1	98.7	83.0	76.1	47.3	0.2
Rwanda	2013	73.4	97.6	72.4	0.0	85.8	53.6	62.4	77.2	99.7	86.8	84.6	61.9	0.9
Rwanda	2015	81.4	90.4	69.4	7.4	86.6	49.7	70.4	69.5	99.8	87.4	88.4	73.9	1.3
Rwanda	2017	74.9	95.6	88.2	5.2	94.1	53.6	73.8	76.2	99.2	91.8	89.7	84.9	6.8
Saint Lucia	2012	75.6	99.8	86.2	11.0	93.2	89.1	86.0	68.1	99.4	96.0	94.3	96.4	96.8
São Tomé and Príncipe	2009	96.3	99.3	81.2	6.0	49.5	42.6	95.2	...	...	78.0	60.7	72.8	0.6
São Tomé and Príncipe	2014	6.9	97.8	86.5	21.4	53.2	44.6	40.2	97.7	99.7	79.7	87.2	78.8	2.3
Senegal	2016	85.0	93.7	45.2	11.3	89.7	65.7	92.9	92.3	98.4	75.9	98.2	89.8	49.0
Senegal	2017	88.2	94.8	93.7	21.8	92.5	69.3	93.5	93.9	94.4	71.8	98.9	91.7	47.4
Senegal	2018	84.6	95.3	93.9	19.9	94.6	72.9	95.1	93.3	97.8	74.1	98.8	93.6	54.9
Senegal	2019	82.4	94.8	94.1	12.7	95.1	73.0	96.3	94.7	99.1	74.4	99.4	95.3	46.6
Serbia	2005	91.3	99.7	99.2	83.7	97.3	94.9	93.0	94.3	97.4	92.2	83.5	...	84.2
Serbia	2010	85.0	99.7	99.2	85.5	99.8	98.7	98.3	95.9	98.4	95.8	94.4	...	85.6
Serbia	2014	85.3	99.6	98.4	83.3	99.3	98.2	99.7	99.2	98.5	96.7	96.8	99.8	82.3
Sierra Leone	2013	44.6	88.9	71.2	0.7	76.7	21.9	81.8	78.9	95.5	60.7	86.0	41.7	0.2
Sierra Leone	2016	37.9	91.4	81.1	1.2	76.8	28.1	78.5	86.7	93.6	62.5	90.4	43.9	0.7
Sierra Leone	2017	30.1	86.7	...	2.0	72.9	27.0	85.1	80.6	99.0	75.3	89.4	45.5	0.9
Sierra Leone	2018	30.1	86.7	76.7	2.4	74.0	27.0	87.3	80.6	99.1	74.3	99.9	47.8	1.2
Somalia	2006	52.9	80.4	66.0	20.6	77.5	49.3	65.1	57.4	84.2	54.9	33.3	41.8	0.3
South Africa	2016	97.4	99.6	98.4	81.5	97.7	77.9	98.7	94.1	97.8	83.4	97.3	93.7	90.7
Sudan	2010	61.5	96.4	95.3	3.0	60.2	46.8	22.1	47.3	37.0	54.4	88.3	...	56.5
Sudan	2014	65.4	94.8	78.9	2.1	68.8	56.4	26.8	50.2	52.9	55.9	88.1	73.0	48.5
Suriname	2000	91.2	98.2	2.5	84.3	99.1	79.7	99.3	...	...	...	...	...	...
Suriname	2006	81.5	98.2	12.6	0.6	98.0	89.9	83.0	97.9	99.3	88.6	81.5	95.2	89.7
Suriname	2010	81.3	99.1	49.1	1.7	97.8	87.7	85.8	98.2	99.6	90.1	96.5	97.3	93.7
Suriname	2018	80.1	99.2	99.1	2.5	98.7	93.6	86.3	94.2	99.4	89.4	99.9	98.9	96.1
Syria	2006	87.6	94.1	...	91.5	94.4	91.3	93.9	92.6	94.5	78.7	61.5	94.5	99.8
Tajikistan	2005	89.8	94.7	...	55.3	97.9	89.4	86.8	74.4	91.1	82.5	26.3	99.7	89.3
Tajikistan	2012	90.0	95.0	93.2	47.6	98.5	93.1	92.9	81.3	98.2	77.1	96.2	99.8	94.8
Tajikistan	2017	91.7	98.6	98.0	50.2	99.7	96.0	94.3	85.6	99.1	80.0	96.9	99.2	97.0
United Republic of Tanzania	2010	58.5	76.8	60.0	1.4	48.6	29.5	76.7	48.6	93.0	77.8	80.9	46.9	4.7
United Republic of Tanzania	2011	70.0	91.1	85.5	2.0	71.6	40.9	78.5	91.0	94.5	81.9	89.4	47.1	2.4
United Republic of Tanzania	2015	61.3	92.3	82.5	1.8	91.0	54.8	81.0	91.8	94.7	80.2	94.0	55.6	7.6
United Republic of Tanzania	2017	71.4	90.0	85.0	2.3	86.7	49.4	78.6	92.1	96.0	81.9	94.2	57.4	7.3
Thailand	2005	39.8	99.0	98.9	9.3	99.8	95.0	80.0	97.1	99.2	87.0	89.2	99.7	80.4
Thailand	2015	37.6	99.7	99.6	11.2	99.6	97.6	71.8	96.3	99.2	84.8	70.5	99.3	84.6
Thailand	2016	37.6	98.7	98.6	10.8	99.6	96.8	85.2	97.6	99.6	90.4	98.2	99.7	84.6
Timor-Leste	2009	63.2	88.6	85.7	19.9	82.9	65.9	70.3	62.9	93.0	71.0	75.6	84.4	8.3
Timor-Leste	2016	55.8	97.0	94.6	0.0	88.9	76.8	85.0	69.1	95.1	79.1	97.5	98.4	21.9
Togo	2010	55.1	87.3	...	0.4	73.1	28.0	95.2	93.2	97.0	71.1	86.1	76.0	5.6
Togo	2013	49.5	91.4	89.1	0.1	78.5	28.0	96.6	91.2	98.8	68.0	92.6	84.1	12.4
Togo	2017	51.3	90.9	89.0	1.2	80.4	28.0	97.5	95.1	98.8	69.4	96.8	88.8	15.9
Trinidad and Tobago	2000	83.0	92.7	9.4	31.3	71.0	62.9	...	96.8	...	89.0	...	...	...
Trinidad and Tobago	2006	83.4	95.7	35.1	19.1	98.7	92.1	80.2	92.1	99.5	94.4	91.2	97.5	99.6
Trinidad and Tobago	2011	84.4	99.5	99.2	31.8	98.4	93.2	84.6	94.7	98.0	94.1	98.0	...	99.9
Tunisia	2011	69.6	99.9	99.6	82.3	99.8	97.8	99.7	99.9	99.7	90.5	97.6	...	99.9
Tunisia	2018	39.5	99.0	98.3	82.7	99.7	98.5	99.9	99.4	99.7	93.1	100.0	99.9	99.8
Turkey	2004	68.9	94.6	12.9	91.3	96.9	95.5	87.7	...	...	83.1	76.4	...	...
Turkey	2013	57.0	99.6	98.5	96.5	99.4	98.6	96.9	...	...	90.1	98.3	...	...
Turkmenistan	2006	82.9	99.9	99.9	48.9	99.8	92.4	88.0	98.5	96.8	89.8	14.7	99.9	...
Turkmenistan	2019	54.2	100.0	100.0	52.1	99.4	97.8	100.0	99.2	99.9	91.3	100.0	99.9	...
Uganda	2011	67.6	94.0	79.6	9.1	78.2	25.9	79.4	73.6	91.4	62.1	86.9	54.8	3.8
Uganda	2014	62.4	90.6	84.1	2.8	70.0	31.6	67.4	67.7	91.9	63.8	89.3	50.9	1.5
Uganda	2016	50.5	91.5	78.1	2.6	70.0	31.8	72.1	73.9	90.3	67.8	91.2	57.7	2.1
Uganda	2019	49.5	87.7	75.5	1.1	70.0	37.9	72.3	73.2	93.2	64.4	92.5	70.5	2.6
Ukraine	2005	91.1	99.4	98.8	96.0	98.8	97.6	83.5	99.7	99.7	97.0	71.8	100.0	98.0
Ukraine	2007	82.0	99.6	...	69.9	99.2	95.8	71.5	96.8	97.8	98.0	82.4	99.9	97.9
Ukraine	2012	82.8	99.8	99.1	74.9	99.8	98.2	82.0	97.8	99.8	98.6	97.3	...	97.5
Uruguay	2006	92.3	99.5	...	52.9	97.6	...	91.0	98.0	86.6	92.1	57.0	98.7	93.3
Uruguay	2011	90.7	95.4	...	53.8	93.7	...	95.5	94.3	94.8	92.5	88.1	95.5	93.7
Uruguay	2013	94.3	99.9	93.8	59.5	98.4	94.4	95.8	94.8	98.1	93.9	94.8	99.0	99.8

		Water			Sanitation			Durable housing				Other basic services		
County	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Uzbekistan	2006	98.4	99.8	...	45.9	99.9	97.7	99.0	99.0	98.8	89.5	22.0	99.7	99.1
Vanuatu	2007	63.3	97.9	96.0	...	91.2	59.7	93.4	93.0	97.1	76.5	75.9	85.4	43.7
Venezuela	2000	87.3	93.0	92.1	69.2	87.9	90.9	100.0	96.5	99.5	80.2	...	...	97.2
Venezuela	2001	89.9	98.0	...	73.3	89.7	...	95.3	89.4	91.3	79.4	...	97.9	97.7
Viet Nam	2002	76.4	96.9	25.8	82.8	86.5	...	94.8	...	97.5	71.8	...	99.4	...
Viet Nam	2005	63.7	98.3	...	80.8	86.9	83.3	96.2	94.4	98.6	80.5	...	99.6	67.4
Viet Nam	2006	59.1	99.0	97.7	2.7	89.6	84.8	94.2	93.4	98.6	89.0	57.0	99.4	71.5
Viet Nam	2010	54.9	98.7	98.6	3.9	93.8	88.9	97.8	94.2	99.4	88.3	94.1	...	81.4
Viet Nam	2013	53.4	98.6	98.5	2.1	92.0	89.4	99.1	95.4	99.4	84.5	97.1	99.9	78.3
Yemen	2006	53.9	74.8	...	39.7	92.6	90.4	82.3	...	...	50.7	61.6	95.5	95.4
Yemen	2013	42.0	96.7	27.6	64.5	90.6	86.3	94.2	92.4	37.6	56.0	95.0	98.6	93.9
Zambia	2002	82.7	90.4	84.4	46.9	49.0	37.3	80.1	...	...	...	...	50.2	41.7
Zambia	2007	76.3	82.2	79.7	28.4	72.0	44.2	84.4	91.0	92.3	63.7	68.1	52.4	41.5
Zambia	2013	73.3	89.3	83.2	24.9	73.3	39.3	85.7	92.4	92.7	69.5	91.4	62.9	25.1
Zambia	2018	71.4	91.2	87.4	17.2	79.2	40.9	88.0	84.2	95.8	69.3	91.8	70.9	18.1
Zimbabwe	2005	97.5	99.6	99.0	85.7	98.2	65.1	99.1	99.2	99.6	79.3	38.8	92.1	88.4
Zimbabwe	2009	76.7	98.1	95.0	85.2	97.7	20.6	97.6	97.9	98.8	78.6	61.5	...	84.2
Zimbabwe	2010	76.7	95.6	93.1	76.4	93.8	49.9	97.0	97.8	98.8	76.8	92.1	84.7	74.3
Zimbabwe	2015	65.0	97.4	93.6	75.5	95.6	52.3	97.2	97.5	99.1	81.5	97.4	81.3	73.0
Zimbabwe	2019	65.5	97.3	91.7	84.5	98.4	43.0	98.9	98.3	98.9	84.2	99.9	90.1	82.8

Notes:

[a] *Improved drinking water sources include: piped water into dwelling, plot or yard; public tap/stand pipe; protected spring; rainwater collection; bottled water (if secondary source is also improved); bore hole/tube well; and, protected dug well.*

[b] *Basic drinking water services are defined as drinking water from an improved water source whose collection time is no more than 30 minutes for a round trip incluidng queuing.*

[c] *Improved sanitation facilities include : flush/pour-flush toilets or latrines connected to a sewer, septic tank or pit; ventilated improved pit latrine; pit latrine with a slab or platform which covers the pit entirely; and, composting toilets/latrines.*

[d] *Basic sanitation services are improved facilities that not shared with other households.*

[e] *Durable floor is floor made of the following materials: parquet, carpet, cement, bricks, tablets, mat, adobe, etc.*

[f] *Durable wall is wall made of finished materials such as covered adobe, bricks, cement blocks, wood planks, etc.*

[g] *Durable roof is roof made of finished materials such as metal, wood, ceramic tiles, cement, roofing shingles, etc.*

[h] *Proportion of population living in households in which not more than three people share the same habitable room.*

Source: United Nations Human Settlement Programme (UN-Habitat), Global Urban Indicators Database 2020.

Table B.2: Population (%) living in households with Access to Improved Water, Improved Sanitation and Other Urban Basic Services in Selected Cities

			Water			Sanitation			Durable housing				Other basic services		
County	City	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Afghanistan	Kabul	2011	38.0	95.2	92.3	2.0	67.1	48.4	99.1	60.7	37.9	37.4	97.2	89.2	88.5
Afghanistan	Kandahar	2011	55.9	99.2	99.2	16.0	89.8	81.1	92.1	65.8	57.1	87.1	92.1	93.7	56.0
Afghanistan	Kunduz	2011	21.0	57.0	55.5	1.0	83.7	78.5	99.4	47.1	77.8	29.6	93.5	70.6	28.5
Afghanistan	Kabul	2015	32.4	95.4	85.8	16.6	78.7	60.8	82.6	69.9	42.2	49.2	94.7	96.5	97.9
Afghanistan	Kandahar	2015	10.2	97.5	39.3	6.7	64.0	56.7	98.3	46.9	23.4	60.1	97.7	86.2	84.6
Albania	Tirana	2009	60.4	98.9	97.5	99.0	100.0	98.6	100.0	99.8	99.2	90.6	97.9	100.0	97.3
Albania	Tirana	2018	21.4	99.4	97.5	97.6	99.1	98.1	99.9	99.7	99.3	93.7	99.1	...	97.9
Angola	Luanda	2006	49.6	100.0	16.4	0.5	93.8	...	97.2	...	...	100.0	40.3	74.3	97.6
Angola	Luanda	2011	55.9	99.1	...	19.3	94.5		95.7	95.6	98.3	59.5	97.0	88.4	96.1
Angola	Benguela	2015	73.2	86.7	55.3	4.5	77.8	47.5	72.9	66.8	98.7	56.3	84.4	56.4	75.2
Angola	Huambo	2015	44.7	83.7	45.7	8.7	89.1	60.7	65.3	44.6	97.6	51.8	69.5	46.3	73.5
Angola	Luanda	2015	56.1	95.9	71.2	12.8	97.3	71.8	94.5	96.2	99.2	67.5	94.9	82.3	97.1
Argentina	Buenos Aires	2011	70.7	97.6	...	...	...	...	98.3	...	...	92.0	89.9	89.9	...
Argentina	Catamarca	2011	98.3	99.8	...	...	...	...	96.0	...	...	89.1	86.2	86.2	...
Argentina	Córdoba	2011	93.8	99.6	...	...	...	...	98.7	...	...	93.3	85.0	85.0	...
Argentina	Corrientes	2011	96.1	99.2	...	...	...	...	95.4	...	...	84.5	91.0	91.0	...
Argentina	Formosa	2011	88.7	91.7	...	...	...	...	91.7	...	...	84.1	89.2	89.2	...
Argentina	La Rioja	2011	98.4	98.7	...	...	...	...	97.0	...	...	85.8	92.5	92.5	...
Argentina	Neuquén	2011	99.0	99.7	...	...	...	...	99.5	...	...	92.2	95.2	95.2	...
Argentina	Salta	2011	98.0	98.2	...	...	...	...	89.7	...	...	80.2	76.5	76.5	...
Argentina	San Juan	2011	98.7	99.4	...	...	...	...	94.9	...	...	85.7	90.7	90.7	...
Argentina	Santiago Del Estero	2011	97.6	99.2	...	...	...	...	93.0	...	...	90.2	90.9	90.9	...
Armenia	Yerevan	2000	99.4	99.4	30.9	92.1	92.7	84.4	68.4	...	...	...	...	99.4	96.5
Armenia	Yerevan	2005	99.5	99.5	11.7	98.8	99.7	97.9	86.0	...	...	87.0	89.9	99.9	99.9
Armenia	Yerevan	2010	99.8	100.0	...	99.3	99.7	98.4	90.5	99.1	99.4	91.6	94.0	99.7	99.9
Armenia	Yerevan	2016	99.9	99.9	...	98.1	99.0	98.4	94.8	94.3	99.7	94.8	98.0	...	...
Azerbaijan	Baku	2006	88.7	99.5	81.6	88.1	98.4	85.1	29.0	97.5	99.8	79.6	77.5	99.5	99.9
Bangladesh	Dhaka	2004	14.1	99.3	...	...	30.6	...	38.2	77.3	99.6	57.6	...	92.2	23.1
Bangladesh	Rajshahi	2004	...	...	...	...	29.2	...	22.7	43.0	93.7	63.6	...	38.1	3.1
Bangladesh	Dhaka	2006	49.9	99.7	99.2	21.6	56.4	38.6	64.1	51.7	98.4	63.0	52.2	88.6	51.2
Bangladesh	Dhaka	2007	66.1	100.0	...	22.2	57.9	35.5	83.0	94.6	100.0	56.6	67.1	97.0	71.0
Bangladesh	Rajshahi	2007	28.9	99.5	...	4.2	66.1	40.9	42.1	65.5	99.5	78.7	50.4	73.7	9.7
Bangladesh	Dhaka	2013	52.6	99.9	99.8	34.4	84.2	51.9	78.5	67.2	99.7	71.0	96.7	94.5	66.8
Belarus	Vitebsk	2005	88.3	99.9	99.5	76.3	98.0	91.7	58.6	98.1	100.0	97.9	61.4	100.0	98.9
Belarus	Vitebsk	2012	95.6	99.9	99.8	83.9	99.4	96.9	91.7	99.9	99.7	98.3	92.9	...	99.3
Belize	Belize City	2006	27.9	99.7	32.0	45.4	97.2	90.7	89.2	83.9	99.4	87.1	72.5	99.0	97.2
Belize	Corozal	2006	...	96.7	45.8	0.0	98.6	92.6	95.8	93.5	...	94.9	77.2	99.5	94.9
Belize	Belize City	2011	30.5	99.8	99.3	47.4	95.1	89.7	50.3	82.5	99.7	89.9	94.1	97.1	99.2
Belize	Belize City South SIde	2016	23.1	95.0	96.3	46.0	96.6	92.6	53.9	71.8	99.1	86.3	97.4	98.3	98.2
Belize	Corozal	2016	2.0	96.1	97.3	5.4	99.2	96.6	94.0	94.4	99.7	89.1	96.0	97.7	94.0
Benin	Cotonou	2001	99.9	100.0	98.2	12.4	80.2	26.0	97.8	87.8	98.8	...	...	77.5	4.7
Benin	Djouguo	2006	63.8	91.1	84.2	...	39.1	20.5	77.7	63.1	94.0	66.1	36.3	51.7	0.8
Benin	Porto-Novo	2006	65.2	76.5	85.6	...	43.8	14.1	93.9	83.6	93.2	65.8	60.0	68.4	11.3
Benin	Cotonou	2011	92.1	98.7	98.7	...	25.1	...	95.4	93.8	90.2	60.7	...	91.5	23.7
Benin	Cotonou	2018	96.5	98.3	98.3	...	85.5	34.3	95.7	89.2	99.1	68.5	...	86.9	28.2
Benin	Djouguo	2018	32.8	93.9	84.8	...	65.3	39.5	85.9	80.3	98.9	65.9	...	57.5	1.7
Benin	Porto-Novo	2018	59.0	85.0	80.8	...	57.5	28.6	95.1	85.1	90.2	74.9	...	58.6	9.8
Bolivia	Cobija	2004	86.5	86.5	21.4	40.0	40.0	8.2	44.3	99.2	25.0	65.9	36.3	85.7	92.2
Bolivia	Cochabamba	2004	83.1	97.6	60.2	65.8	65.8	15.9	92.7	64.4	35.6	72.2	32.8	97.2	94.6
Bolivia	La Paz	2004	87.7	90.1	43.1	54.7	54.7	19.0	79.1	43.7	8.8	59.7	33.2	94.3	91.7
Bolivia	Oruro	2004	93.2	94.2	66.6	58.8	58.8	20.2	92.3	20.8	14.1	59.4	25.0	96.7	96.7
Bolivia	Potosí	2004	96.3	96.4	61.8	71.5	71.5	29.6	89.7	12.3	22.5	57.3	18.8	97.2	98.4
Bolivia	Santa Cruz	2004	95.6	96.0	42.5	48.3	48.3	11.4	89.1	90.5	73.1	60.4	48.5	92.1	87.2
Bolivia	Sucre	2004	96.3	97.2	52.3	83.7	83.7	29.5	94.2	48.5	64.1	65.6	25.9	95.0	93.0
Bolivia	Tarija	2004	96.8	97.4	32.1	72.2	72.2	27.7	90.4	77.3	47.2	65.3	34.2	92.2	88.5
Bolivia	Trinidad	2004	59.5	65.2	24.2	33.8	33.8	5.5	46.0	72.1	55.9	52.7	23.0	82.2	63.0
Bolivia	Cobija	2008	85.5	87.1	5.3	31.2	78.1	62.2	44.9	37.2	96.0	75.9	88.2	96.2	92.4
Bolivia	Cochabamba	2008	83.0	98.1	76.9	63.7	82.4	61.4	89.6	99.4	98.8	72.7	77.8	98.6	94.0
Bolivia	La Paz	2008	97.8	97.9	0.0	75.4	82.7	56.6	53.1	99.8	99.7	71.0	80.6	98.7	97.5
Bolivia	Oruro	2008	96.3	97.3	43.3	65.1	68.8	48.2	67.5	99.4	98.2	67.5	73.7	96.9	98.2
Bolivia	Potosí	2008	97.6	97.8	11.3	78.6	81.2	51.2	71.1	99.4	97.8	61.7	76.4	97.8	98.9

Table B.2: Continued

			Water			Sanitation			Durable housing				Other basic services		
County	City	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Bolivia	Santa Cruz	2008	98.9	99.0	...	22.7	78.1	55.2	92.7	95.0	97.6	65.9	86.4	97.6	92.9
Bolivia	Sucre	2008	93.4	98.5	64.6	71.6	73.0	50.0	85.9	100.0	98.2	67.2	68.7	97.3	91.4
Bolivia	Tarija	2008	99.5	99.7	38.4	74.3	88.6	62.9	93.0	97.8	99.2	75.5	84.3	95.7	93.3
Bolivia	Trinidad	2008	63.2	66.4	6.5	18.4	67.2	48.2	44.4	59.8	81.0	56.7	65.6	90.5	71.4
Bosnia and Herzegovina	Sarajevo	2006	97.3	99.6	99.6	92.3	98.2	98.2	82.5	98.2	96.8	97.7	73.1	100.0	95.4
Bosnia and Herzegovina	Tuzla	2006	72.8	72.8	...	89.8	99.7	99.6	...	...	...	98.1	67.9	...	96.3
Bosnia and Herzegovina	Sarajevo	2012	100.0	100.0	100.0	98.3	99.2	98.2	99.9	99.8	100.0	99.2	95.7	...	85.1
Bosnia and Herzegovina	Tuzla	2012	81.0	100.0	97.1	93.2	100.0	99.5	99.7	96.6	100.0	93.9	97.9	...	63.3
Botswana	Francistown	2015	98.8	99.0	...	59.7	80.2	...	99.0	93.7	99.0	86.6	...	77.8	76.7
Botswana	Gaborone	2015	94.7	96.2		58.7	86.9	...	95.8	94.2	95.8	87.1	...	85.7	94.4
Burkina Faso	Ouagadougou	2003	96.0	98.7	83.4	14.3	78.5	52.2	96.5	...	...	...	...	57.1	16.0
Burkina Faso	Ouagadougou	2006	83.8	99.0	...	...	16.7	15.2	98.3	51.5	99.6	81.1	65.9	66.3	24.1
Burkina Faso	Ouagadougou	2010	93.6	99.1	91.3	2.7	95.3	68.3	89.6	82.4	97.9	73.1	92.4	58.1	25.1
Burkina Faso	Ouagadougou	2014	95.6	95.6	79.2	3.4	99.0	67.4	85.3	82.4	96.1	74.6	97.7	62.1	45.8
Burkina Faso	Ouagadougou	2018	93.9	97.3	90.3	...	96.9	58.2	90.6	90.3	99.9	84.4	...	72.6	56.7
Burundi	Bujumbura	2012	97.5	97.8	91.9	17.5	92.9	38.9	78.6	88.2	...	74.3	88.9	69.5	0.0
Cambodia	Phnom Penh	2000	76.8	98.0	88.3	82.5	82.5	72.3	80.0	98.5	...	...	...	98.2	38.1
Cambodia	Siem Reap	2000	...	58.4	34.4	24.7	24.7	21.6	21.0	82.7	...	...	...	54.8	5.0
Cambodia	Phnom Penh	2004	81.1	83.3	...	86.6	87.5	...	...	...	...	51.8	83.6	92.7	56.9
Cambodia	Siem Reap	2004	17.5	21.3	...	70.1	71.9	...	...	...	...	40.1	76.7	77.8	28.3
Cameroon	Douala	2006	77.0	98.7	...	5.2	63.5	48.3	75.8	0.0	99.3	84.9	80.3	99.2	48.6
Cameroon	Yaoundé	2006	94.6	98.4	...	1.6	59.1	41.8	81.5	0.0	98.5	78.8	84.9	99.3	52.5
Cameroon	Douala	2011	62.4	99.0	90.3	0.9	96.2	61.0	92.6	98.4	99.9	81.8	97.3	97.8	45.2
Cameroon	Yaoundé	2011	84.3	98.1	85.7	2.8	91.1	51.9	93.5	86.3	98.2	81.0	95.3	99.2	56.7
Cameroon	Bafoussam	2018	49.1	90.2	84.1	1.1	92.0	66.2	86.4	85.1	99.7	85.6	97.6	95.7	18.4
Cameroon	Garoua	2018	42.3	89.7	83.0	1.4	83.3	72.3	77.7	79.4	93.2	73.8	91.1	67.7	7.6
Cameroon	Yaoundé	2018	62.0	98.5	92.7	3.8	89.9	52.9	93.6	94.7	96.0	74.5	98.0	99.3	63.5
Central African Republic	Bangui	2000	81.1	98.2	73.8	3.4	30.6	...	50.0	94.5	97.2	99.9	...	36.1	...
Central African Republic	Bangui	2006	82.7	97.5	70.2	1.5	67.6	38.0	45.1	98.6	98.7	99.8	44.5	46.6	2.3
Central African Republic	Bangui	2010	82.0	96.4	56.0	0.3	95.7	48.5	45.4	70.1	97.6	98.3	91.7	46.9	0.7
Chad	N'Djaména	2004	51.2	67.3	23.8	12.2	35.3	...	31.6	98.7	97.8	63.9	...	35.3	...
Chad	N'Djaména	2010	72.7	99.4	14.1	6.2	72.6	42.7	40.1	65.7	90.9	95.9	92.2	42.4	15.1
Chad	N'Djaména	2014	56.6	99.8	91.2	...	69.8	32.2	37.8	73.4	98.8	58.5	94.9	54.8	35.0
Colombia	Armenia	2005	97.7	99.9	...	99.0	99.9	8.4	97.4	90.1	...	92.2	...	98.1	97.7
Colombia	Barranquilla	2005	87.2	95.9	28.0	78.4	95.0	13.8	97.6	97.8	...	75.1	...	99.6	94.6
Colombia	Bogotá D.C.	2005	96.9	99.8	28.8	99.5	99.9	16.0	92.8	99.1	...	87.7	...	99.6	97.8
Colombia	Bucaramanga	2005	95.9	98.6	...	94.0	97.3	12.5	84.8	93.0	...	90.5	...	99.9	94.8
Colombia	Cali	2005	98.3	99.8	34.1	97.8	98.7	16.9	96.2	92.9	...	88.7	...	99.9	97.2
Colombia	Cartagena de Indias	2005	83.5	95.3	31.6	58.9	91.9	9.2	96.4	91.4	...	73.0	...	99.8	93.3
Colombia	Cúcuta	2005	96.3	98.7	...	92.4	97.6	10.4	96.4	88.7	...	80.2	...	99.7	95.1
Colombia	Ibagué	2005	98.3	99.4	...	98.7	99.8	13.0	96.0	92.0	...	84.0	...	99.1	95.4
Colombia	Manizales	2005	99.5	99.5	...	99.8	99.8	3.8	88.9	76.8	...	92.7	...	99.6	98.3
Colombia	Medellín	2005	91.5	97.3	26.7	95.5	98.9	6.2	93.9	91.5	...	86.8	...	98.9	96.3
Colombia	Montería	2005	63.8	92.8	43.1	54.0	94.3	13.0	88.1	89.0	...	73.1	...	99.1	86.7
Colombia	Neiva	2005	99.1	99.3	...	97.3	98.8	15.1	91.6	85.6	...	84.7	...	98.7	90.7
Colombia	Pereira	2005	97.9	97.9	...	99.3	99.8	10.3	92.5	76.5	...	90.4	...	99.4	98.1
Colombia	Popayán	2005	80.3	99.1	64.8	93.7	95.8	13.9	78.6	82.7	...	86.1	...	97.2	88.8
Colombia	Riohacha	2005	66.5	95.8	36.5	75.9	96.4	8.9	81.2	93.7	...	73.2	...	98.9	91.7
Colombia	Santa Marta	2005	79.7	96.1	...	63.5	93.8	12.6	96.7	91.9	...	67.7	...	98.7	85.3
Colombia	Sincelenjo	2005	89.4	97.9	43.7	84.3	94.7	11.3	97.8	80.9	...	71.9	...	99.3	84.1
Colombia	Tunja	2005	89.5	98.6	...	96.9	99.4	11.6	90.1	90.5	...	89.3	...	99.7	87.6
Colombia	Valledupar	2005	91.4	99.0	...	80.3	91.6	14.8	93.8	95.4	...	67.3	...	97.5	93.3
Colombia	Villavicencio	2005	71.6	87.2	...	98.2	99.3	17.4	87.7	97.2	...	83.3	...	99.3	97.2
Colombia	Armenia	2010	97.2	100.0	...	97.7	99.5	93.2	64.3	92.9	...	92.9	95.3	98.6	98.5
Colombia	Barranquilla	2010	95.1	99.9	93.0	80.3	97.0	85.7	48.6	98.2	...	83.7	94.6	99.7	97.4
Colombia	Bogotá D.C.	2010	98.6	99.9	...	99.4	99.8	91.8	78.6	99.2	...	93.2	96.6	99.5	99.0
Colombia	Bucaramanga	2010	97.2	98.9	...	95.9	99.0	87.0	68.4	92.3	...	92.2	96.1	99.2	96.6
Colombia	Cali	2010	96.2	98.6	10.1	95.4	97.8	87.0	70.4	94.2	...	92.6	94.3	99.3	97.9
Colombia	Cartagena de Indias	2010	83.1	95.7	63.1	68.9	92.0	81.8	45.3	90.0	...	75.4	92.0	99.6	94.4
Colombia	Cúcuta	2010	94.3	97.7	...	93.0	98.6	87.5	55.3	91.0	...	80.4	94.2	99.3	96.0
Colombia	Ibagué	2010	93.4	98.9	13.9	94.0	96.9	89.1	37.4	91.7	...	87.1	90.8	99.3	93.9
Colombia	Manizales	2010	97.8	99.7	0.0	98.3	99.6	91.5	57.9	78.3	...	93.3	96.9	100.0	98.1

Table B.2: Continued

			Water			Sanitation			Durable housing				Other basic services		
County	City	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Colombia	Medellín	2010	96.1	98.8	20.7	94.0	99.1	95.4	67.3	94.0	...	91.8	91.6	99.8	98.8
Colombia	Montería	2010	73.9	93.1	26.5	43.8	94.8	83.6	22.2	83.4	...	76.2	91.4	99.5	85.4
Colombia	Neiva	2010	97.1	97.1	...	97.0	99.2	89.3	45.6	89.7	...	86.6	94.2	99.4	96.0
Colombia	Popayán	2010	88.6	98.0	...	93.2	99.0	85.3	60.3	85.9	...	92.2	95.5	99.4	96.3
Colombia	Quibdo	2010	32.7	99.9	97.9	29.9	74.9	69.2	28.9	68.3	...	89.3	93.6	92.7	84.0
Colombia	Riohacha	2010	67.5	98.8	27.3	73.0	92.0	86.3	24.9	84.8	...	71.0	94.4	99.4	86.3
Colombia	Santa Marta	2010	79.5	93.2	36.1	60.7	94.1	85.9	30.5	94.7	...	74.9	89.9	99.8	91.9
Colombia	Sincelenjo	2010	77.2	95.3	72.6	70.1	91.1	82.9	25.9	79.9	...	69.6	91.2	99.4	82.8
Colombia	Valledupar	2010	94.9	97.9	...	88.3	96.4	89.0	26.8	91.9	...	75.4	93.2	98.4	94.1
Colombia	Villavicencio	2010	59.4	94.9	26.6	97.1	99.6	87.4	52.7	96.2	...	87.9	97.2	99.1	96.5
Colombia	Armenia	2015	96.0	100.0	...	99.5	100.0	97.4	97.6	93.4	...	97.9	98.8	99.7	99.1
Colombia	Barranquilla	2015	98.0	99.7	...	93.3	98.4	86.9	97.9	97.7	...	86.1	97.0	99.8	98.6
Colombia	Bucaramanga	2015	97.0	99.7	0.0	98.7	99.8	93.3	99.1	97.1	...	97.4	97.6	100.0	99.3
Colombia	Cali	2015	97.0	99.4	58.6	96.3	98.5	93.3	98.3	96.4	...	96.0	97.7	99.8	99.0
Colombia	Cartagena de Indias	2015	87.8	95.3	60.6	67.5	95.4	88.1	93.4	90.3	...	88.1	97.4	99.8	96.8
Colombia	Cúcuta	2015	93.1	99.0	...	97.9	99.4	95.2	98.1	94.5	...	91.3	97.4	99.9	98.4
Colombia	Ibagué	2015	90.6	99.8	...	98.1	98.8	90.4	97.3	94.1	...	92.1	97.4	99.5	97.6
Colombia	Medellín	2015	95.6	99.4	31.2	96.0	98.6	96.2	98.3	95.3	...	95.1	96.6	99.9	99.6
Colombia	Montería	2015	62.8	97.9	54.2	70.8	98.5	92.2	86.7	90.0	...	89.0	97.7	100.0	96.5
Colombia	Neiva	2015	95.5	99.4	...	95.8	98.4	94.0	96.8	91.9	...	96.0	99.5	99.7	98.7
Colombia	Pereira	2015	98.7	99.9	...	96.6	99.2	95.4	94.0	93.7	...	97.7	98.7	99.7	99.6
Colombia	Popayán	2015	94.2	99.4	...	93.5	99.1	87.2	94.8	89.1	...	95.0	98.2	99.7	97.2
Colombia	Riohacha	2015	38.3	99.2	88.3	84.3	97.7	94.9	95.1	92.4	...	82.7	98.1	100.0	95.4
Colombia	Santa Marta	2015	64.8	97.1	74.5	68.7	97.0	92.3	94.9	96.1	...	77.9	97.7	98.4	96.0
Colombia	Sincelenjo	2015	93.1	97.9	43.7	74.4	97.0	91.5	85.2	86.7	...	88.7	97.8	99.5	93.9
Colombia	Tunja	2015	76.1	99.8	...	99.5	100.0	94.0	96.7	96.1	...	95.9	99.1	100.0	97.3
Colombia	Valledupar	2015	98.3	99.3	...	90.3	97.7	94.0	94.4	94.0	...	82.4	97.0	99.2	98.0
Colombia	Villavicencio	2015	57.3	98.3	...	99.4	100.0	95.4	98.2	95.3	...	95.8	99.3	99.7	99.0
Comoros	Moroni	2012	88.2	99.9	85.9	9.0	26.6	22.4	74.8	86.1	98.3	82.7	93.7	85.1	6.1
Congo	Brazzaville	2009	85.1	98.9	...	6.6	74.3	14.5	92.8	86.0	98.9	75.4	90.4	62.4	17.5
Congo	Brazzaville	2011	76.6	96.2	78.5	2.2	61.8	17.4	89.6	88.0	99.1	69.1	94.1	63.7	23.6
Congo	Brazaville	2014	70.4	98.1	92.9	0.0	79.7	31.0	93.9	89.9	98.5	66.4	97.2	85.7	39.1
Congo	Brazzaville	2014	70.4	98.1	92.9	25.2	79.6	31.0	93.9	91.0	99.4	100.0	97.2	85.7	39.1
Democratic Republic of the Congo	Kinshasa	2000	68.1	70.3	69.9	7.4	73.8	...	99.8	86.5	97.0	32.2	...	...	...
Democratic Republic of the Congo	Kinshasa	2007	89.8	94.1	73.4	30.9	63.0	16.0	91.7	...	98.0	...	78.9	84.1	27.5
Democratic Republic of the Congo	Kinshasa	2010	78.6	88.8	5.6	0.6	57.3	18.5	90.1	94.1	99.5	55.3	86.6	76.3	15.3
Democratic Republic of the Congo	Kinshasa	2014	51.8	99.2	84.3	0.8	64.1	20.7	93.2	92.6	99.7	51.0	95.9	90.4	15.4
Costa Rica	San José	2011	99.5	99.5	99.5	48.4	97.2	95.7	91.9	88.9	96.5	94.1	95.0	99.8	99.7
Cote d'Ivoire	Abidjan	2006	89.4	92.7	18.9	16.6	89.8	39.3	98.7	95.2	98.7	99.4	75.5	92.5	1.6
Cote d'Ivoire	Abidjan	2012	98.5	98.9	95.7	27.2	46.8	...	99.1	...	...	...	96.6	96.6	...
Dominican Republic	La Romana	2002	8.2	97.6	89.6	60.0	83.6	67.8	96.5	91.0	34.0	71.3	...	98.4	95.2
Dominican Republic	La Vega	2002	41.3	93.9	70.2	67.9	93.2	86.0	97.5	93.4	31.5	84.7	...	99.3	96.4
Dominican Republic	San Francisco de Macorís	2002	19.3	99.2	74.3	61.7	94.2	88.7	98.6	95.1	33.0	90.2	...	99.6	96.9
Dominican Republic	Santiago	2002	45.7	99.9	82.4	82.5	90.9	87.4	97.5	98.5	39.2	84.4	...	99.3	96.2
Dominican Republic	Santo Domingo	2002	13.1	99.8	90.4	85.3	88.3	83.0	98.2	97.8	54.7	82.0	...	99.2	97.9
Dominican Republic	La Romana	2007	6.7	99.3	96.0	69.6	93.3	70.5	98.1	92.1	37.5	79.9	79.5	98.9	94.7
Dominican Republic	La Vega	2007	31.9	98.9	97.3	79.2	96.8	90.7	98.9	98.5	29.3	89.2	77.5	99.0	96.7
Dominican Republic	San Francisco de Macorís	2007	10.2	99.5	96.8	72.6	95.6	90.2	99.1	97.5	36.0	87.8	78.3	98.4	95.4
Dominican Republic	San Juan	2007	53.8	99.3	93.4	55.4	89.1	82.0	90.0	88.6	36.2	85.4	65.0	99.7	79.9
Dominican Republic	Santiago	2007	32.5	99.2	99.1	89.9	99.2	94.6	99.3	98.5	48.3	92.7	84.7	99.4	96.4
Dominican Republic	Santo Domingo	2007	9.0	99.8	98.3	86.6	96.4	89.1	98.4	95.7	58.7	86.8	82.3	99.0	97.8
Dominican Republic	La Romana	2013	1.9	100.0	...	80.5	96.3	78.8	99.0	92.5	47.4	80.1	93.9	99.6	95.0
Dominican Republic	La Vega	2013	19.3	99.6	62.9	83.3	96.6	90.9	98.1	96.9	35.7	89.3	91.9	99.1	94.0
Dominican Republic	San Juan	2013	20.5	96.2	86.1	66.3	94.1	84.4	96.4	96.0	23.3	83.8	91.9	98.8	83.0
Dominican Republic	Santiago	2013	8.6	98.6	86.5	87.4	96.7	89.7	98.2	98.7	51.0	89.6	94.1	99.5	94.8
Dominican Republic	Santo Domingo	2013	2.7	99.4	91.6	88.9	98.1	89.2	98.0	94.5	52.4	83.9	94.3	100.0	96.4
Egypt	Alexandria	2005	98.9	99.6	...	86.1	86.7	84.6	99.7	...	...	96.8	41.0	99.9	99.1
Egypt	Cairo	2005	99.3	100.0	86.8	75.8	76.4	76.0	99.5	...	...	95.0	51.3	99.8	99.0
Egypt	Alexandria	2008	99.6	100.0	...	88.4	89.1	88.2	99.5	...	...	96.0	64.8	99.6	...
Egypt	Cairo	2008	99.9	100.0	...	81.0	81.9	81.5	99.4	...	...	95.9	57.0	100.0	...
Egypt	Alexandria	2014	97.1	97.1	95.6	95.3	99.9	99.6	99.0	...	...	93.9	96.8	...	...
Egypt	Cairo	2014	99.1	100.0	...	99.8	100.0	98.9	99.5	...	...	94.4	94.9	100.0	...

Table B.2: Continued

			Water			Sanitation			Durable housing				Other basic services		
County	City	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Eswatini	Mbabane	2006	86.4	92.5	72.6	45.7	54.6	45.5	95.8	79.9	99.6	79.4	80.8	62.9	65.3
Ethiopia	Addis Ababa	2005	99.9	99.9	90.3	2.2	73.3	26.8	86.4	21.6	99.8	50.7	37.0	97.2	5.0
Ethiopia	Addis Ababa	2011	99.6	99.6	81.1	5.8	73.2	24.5	86.3	25.2	98.8	64.1	89.5	98.6	10.3
Ethiopia	Addis Ababa	2016	97.1	99.7	75.8	10.0	81.6	29.0	94.0	35.4	97.7	66.9	97.5	99.8	59.6
Gabon	Libreville	2000	99.5	99.7	92.3	37.6	69.2	44.7	96.7	97.9	99.1	75.2		95.7	92.5
Gabon	Libreville/Port-Gentil	2012	97.1	98.4	69.5	45.6	77.1	47.0	96.8	100.0	99.7	75.6	98.3	99.5	96.0
Gambia	Banjul	2006	80.3	80.8	8.4	45.5	96.6	39.8	98.9	76.5	...	63.0	81.7	83.0	4.7
Gambia	Banjul	2018	99.9	100.0	100.0	98.4	99.7	56.0	99.8	97.1	99.2	82.0	99.0	96.3	2.6
Georgia	Tbilisi	2005	99.9	100.0	100.0	98.0	99.9	96.5	99.3	97.8	99.5	87.0	76.0	98.6	98.6
Georgia	Tbilisi	2018	98.6	100.0	99.8	98.4	99.4	97.2	97.8	99.3	96.7	93.8	99.2	99.9	99.8
Ghana	Accra	2006	62.6	68.8	67.7	4.8	87.8	23.2	99.0	97.9	100.0	61.4	77.1	89.3	37.1
Ghana	Accra	2008	59.4	99.0	91.7	10.2	93.9	28.6	96.0	96.8	99.4	71.8	91.2	90.5	44.2
Ghana	Accra	2014	29.3	99.8	97.4	22.7	92.2	26.7	98.8	90.4	99.6	70.9	96.9	95.2	52.3
Ghana	Kumasi	2014	48.3	96.1	88.5	11.0	84.8	20.9	98.7	97.1	...	60.2	93.9	93.1	34.6
Ghana	Accra	2016	31.8	99.9	98.8	1.5	95.7	30.5	89.0	88.5	99.9	68.8	96.7	93.8	46.1
Ghana	Kumasi	2016	38.7	89.3	79.5	...	96.2	24.0	79.5	95.9	99.4	61.3	97.1	89.2	36.7
Ghana	Accra	2019	11.8	100.0	99.5	2.2	97.1	23.5	99.1	95.7	100.0	74.1	97.8	97.6	55.1
Ghana	Kumasi	2019	36.2	99.3	99.1	...	88.7	36.3	99.8	95.6	99.3	66.2	96.7	90.5	39.6
Guatemala	Guatemala city	2014	36.3	100.0	98.9	86.5	96.1	83.5	92.4	90.2	99.9	78.3	96.7	98.9	89.3
Guinea	Conakry	2005	91.7	95.0	88.8	12.6	74.7	29.5	97.8	...	...	...	...	95.5	0.8
Guinea	Conakry	2012	86.5	99.4	76.6	7.7	91.1	38.3	94.9	99.3	99.9	59.1	96.9	93.8	0.3
Guinea Bissau	SAB	2000	52.4	87.7	58.7	1.7	11.7	3.0	99.8	93.8	90.3	34.7	...	...	...
Guinea Bissau	SAB	2006	59.6	92.1	64.6	17.9	37.1	27.1	88.3	46.4	94.7	49.8	67.5	44.0	3.4
Guinea Bissau	SAB	2014	71.2	96.9	77.5	2.2	63.8	32.0	82.5	25.2	98.8	61.1	98.2	43.6	2.0
Guyana	Georgetown	2005	30.8	99.5	99.4	13.1	96.3	82.9	77.6	82.7	98.7	78.9	73.0	79.0	74.9
Guyana	Georgetown	2009	14.8	99.2	...	17.3	98.2	94.4	76.0	98.1	94.6	84.5	91.2	90.9	85.4
Haiti	Port-Au- Prince	2006	60.7	98.0	89.5	4.6	58.8	30.0	96.8	98.3	100.0	62.2	52.5	89.8	9.6
Haiti	Port-Au- Prince	2012	39.2	97.8	89.5	3.8	85.8	41.3	94.0	92.2	97.4	54.9	93.9	87.6	10.0
Haiti	Port-Au- Prince	2017	23.2	99.1	92.4	1.1	85.1	49.2	94.8	93.5	96.3	63.3	92.9	88.8	13.2
Honduras	Tegucigalpa	2005	58.3	96.8	58.3	69.8	85.1	70.9	65.4	75.4	98.7	71.9	55.5	...	69.5
Honduras	Tegucigalpa	2012	49.4	99.5	77.7	74.7	92.0	78.2	67.2	79.3	99.1	74.9	93.1	...	71.5
India	Hyberabad	2006	88.2	99.9	86.1	52.6	79.2	54.2	60.0	86.8	88.8	41.9	37.2	91.6	65.9
India	Jaipur	2006	90.1	98.9	50.0	53.2	98.7	65.3	98.4	...	99.7	70.5	56.9	...	83.9
India	Kanpur	2006	43.9	99.1	94.9	38.1	81.4	51.0	83.3	94.8	92.9	49.1	43.1	93.6	65.7
India	Kolkota	2006	78.8	99.9	94.5	40.1	98.1	47.0	96.7	95.9	98.6	58.2	46.0	97.7	56.3
India	Mumbai	2006	97.6	99.1	90.5	77.9	95.8	50.7	87.8	97.1	99.3	43.2	51.8	99.0	79.8
India	New Delhi	2006	85.3	100.0	62.2	73.6	85.1	66.5	96.0	98.2	96.9	55.6	61.2	99.4	82.6
India	Hyberabad	2016	64.9	98.1	94.6	8.7	85.4	77.8	75.9	97.0	95.7	61.1	96.1	99.6	89.8
India	Jaipur	2016	77.2	98.2	79.4	20.0	85.0	74.1	88.9	96.4	94.1	67.1	98.4	98.7	78.3
India	Kolkota	2016	59.3	98.1	92.7	3.9	86.2	62.5	80.5	89.6	89.5	72.4	94.7	97.4	58.8
India	Mumbai	2016	92.3	98.7	81.0	28.9	83.6	60.3	92.3	94.7	98.4	50.8	97.7	95.8	87.4
India	New Delhi	2016	75.7	99.7	84.2	57.5	93.0	74.9	96.7	97.8	92.5	60.1	98.8	99.8	98.1
India	Srinagar	2016	86.6	98.2	87.6	18.9	75.9	67.8	93.2	93.7	98.3	83.6	98.8	99.7	89.8
Indonesia	Bandung	2002	17.6	78.8	68.2	...	87.0	...	88.1	80.8	99.3	...	...	97.9	12.6
Indonesia	Jakarta	2002	40.3	89.3	96.1	...	98.6	...	97.7	89.0	99.6	...	...	99.9	34.4
Indonesia	Kediri	2002	30.4	92.0	49.8	...	77.6	...	93.3	89.9	99.6	...	...	99.9	21.3
Indonesia	Medan	2002	37.7	73.4	48.7	...	88.3	...	95.7	67.5	92.1	...	...	93.4	20.3
Indonesia	Surabaya	2002	29.0	86.4	97.4	...	72.9	...	94.3	91.3	...	...	...	...	17.7
Indonesia	Bandung	2007	19.4	77.6	35.5	...	93.6	81.7	93.6	99.9	99.9	...	...	98.5	20.1
Indonesia	Jakarta	2007	35.5	95.2	66.4	...	96.1	81.0	98.3	99.4	99.8	...	...	99.7	37.6
Indonesia	Medan	2007	51.6	82.0	35.2	...	95.9	86.3	93.2	99.1	97.1	...	...	99.6	25.0
Indonesia	Palembang	2007	26.2	78.1	53.0	...	89.3	77.7	77.8	99.4	94.6	...	...	96.2	22.3
Indonesia	Surabaya	2007	17.5	86.6	54.8	...	84.5	74.4	91.1	99.5	...	...	...	99.3	14.3
Indonesia	Surakarta	2007	33.9	78.1	40.6	...	80.2	69.0	88.7	99.9	99.8	...	...	96.6	14.8
Indonesia	Ujung Pandang	2007	57.6	81.5	71.4	...	93.7	84.7	66.4	90.5	97.1	...	...	99.3	26.0
Indonesia	Bandung	2012	12.4	67.3	35.3	...	90.5	...	94.1	99.0	99.6	85.0	93.3	99.5	84.0
Indonesia	Jakarta	2012	19.2	73.2	62.9	...	99.3	...	96.4	98.2	98.5	75.0	98.0	99.7	90.9
Indonesia	Medan	2012	23.3	53.9	33.1	...	96.5	...	96.4	97.6	98.8	78.9	95.3	99.4	73.1
Indonesia	Palembang	2012	38.7	62.2	14.1	...	94.0	...	88.6	99.1	98.4	79.9	95.5	99.8	87.4
Indonesia	Surabaya	2012	20.8	64.3	46.5	...	86.2	...	94.5	98.1	99.6	88.9	93.0	99.7	77.6
Indonesia	Surakarta	2012	21.9	73.2	39.4	...	85.0	...	93.1	98.3	99.3	91.5	87.8	99.4	71.8
Indonesia	Ujung Pandang	2012	31.0	43.7	17.2	...	92.1	...	66.0	85.7	95.8	66.4	95.2	99.2	78.1

Table B.2: Continued

			Water			Sanitation			Durable housing				Other basic services		
County	City	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Indonesia	Bandung	2017	9.6	95.9	94.6	5.3	93.3	...	98.7	96.6	99.9	88.0	95.9	99.0	93.0
Indonesia	Medan	2017	22.5	98.6	98.3	2.7	97.0	...	99.3	93.8	99.2	81.3	96.1	99.6	90.6
Indonesia	Palembang	2017	30.1	92.9	91.9	2.8	94.2	...	99.1	94.1	98.4	77.2	98.1	99.2	93.4
Indonesia	Surabaya	2017	10.5	97.7	97.5	5.8	94.5	...	96.8	96.3	100.0	93.5	95.5	99.0	89.6
Indonesia	Surakarta	2017	21.2	95.4	94.6	4.6	94.3	...	94.3	92.3	99.8	93.1	94.3	98.6	85.1
Indonesia	Ujung Pandang	2017	23.0	98.7	98.0	7.7	95.9	...	98.2	94.9	99.1	78.3	97.9	99.3	94.5
Iraq	Baghdad	2006	97.9	99.8	99.8	65.1	99.7	72.4	99.3	98.1	96.0	55.4	66.5	99.7	87.6
Iraq	Basra	2006	0.7	3.7	3.7	43.3	91.8	68.8	95.9	71.3	94.7	66.9	78.8	99.9	98.3
Iraq	Kirkuk	2006	...	...	...	11.6	99.8	83.8	97.4	93.8	92.7	48.0	89.1	...	99.2
Jordan	Ajloun	2007	71.4	99.3	...	38.8	99.9	97.9	100.0	99.8	...	63.2	93.6	99.5	100.0
Jordan	Amman	2007	69.1	99.9	...	79.6	99.9	95.3	100.0	99.1	...	73.2	94.6	98.6	99.9
Jordan	Aqaba	2007	97.1	100.0	...	77.4	98.5	97.6	99.3	99.2	...	64.1	94.0	98.6	99.5
Jordan	Balqa	2007	78.3	99.2	...	76.3	99.7	98.9	99.7	99.6	...	66.7	90.1	99.1	100.0
Jordan	Irbid	2007	62.7	99.5	...	37.4	99.5	97.6	100.0	99.9	...	66.4	93.3	99.3	100.0
Jordan	Jerash	2007	82.3	99.6	...	36.5	99.6	96.9	100.0	100.0	...	57.3	89.9	99.4	100.0
Jordan	Kerak	2007	88.0	100.0	...	23.6	99.4	93.1	100.0	96.6	...	58.0	90.1	99.6	99.9
Jordan	Madaba	2007	84.9	99.7	...	63.8	100.0	98.9	100.0	100.0	...	63.4	91.3	98.8	99.9
Jordan	Mafraq	2007	88.2	99.7	...	36.3	99.9	95.2	...	100.0	...	59.3	90.5	99.5	100.0
Jordan	Zarqa	2007	73.1	99.9	...	69.9	99.9	98.8	99.9	99.6	...	69.1	93.4	99.8	100.0
Jordan	Ajloun	2009	64.0	98.9	...	43.8	100.0	99.2	100.0	100.0	...	71.2	98.2	99.6	99.9
Jordan	Balqa	2009	70.6	98.5	...	71.1	100.0	97.0	100.0	99.4	...	64.7	97.0	99.4	99.9
Jordan	Madaba	2009	67.4	100.0	...	65.0	100.0	97.0	100.0	99.7	...	67.5	98.0	99.7	100.0
Jordan	Mafraq	2009	76.5	99.8	...	36.1	99.9	97.7	...	99.8	...	69.9	98.6	...	99.9
Jordan	Ajloun	2012	41.6	96.9	...	43.7	100.0	99.7	100.0	99.4	99.6	75.2	98.9	99.6	100.0
Jordan	Amman	2012	51.6	100.0	...	78.5	100.0	99.8	100.0	99.7	99.7	77.1	99.4	99.5	100.0
Jordan	Balqa	2012	65.3	99.3	...	73.8	100.0	99.6	99.9	99.2	94.5	74.6	99.0	99.4	100.0
Jordan	Irbid	2012	37.7	99.9	...	43.6	99.6	99.6	...	100.0	99.9	83.0	99.1	99.3	99.8
Jordan	Zarqa	2012	60.4	100.0	...	85.1	100.0	99.4	99.8	99.9	98.9	70.9	99.2	99.6	100.0
Jordan	Amman	2018	65.0	100.0	100.0	83.8	100.0	99.9	100.0	99.4	99.0	83.7	99.0	...	100.0
Jordan	Balqa	2018	87.0	99.7	99.7	78.3	99.6	96.1	99.1	98.6	97.9	74.0	97.4	...	99.7
Jordan	Irbid	2018	33.7	99.6	99.1	54.8	99.9	96.0	100.0	99.2	99.6	72.3	98.2	...	99.9
Jordan	Ma'an	2018	71.1	100.0	100.0	47.5	100.0	99.8	99.9	98.3	98.9	75.2	97.0	...	99.4
Jordan	Mafraq	2018	45.1	100.0	98.9	32.0	99.8	98.3	99.3	97.4	98.0	53.6	97.1	...	100.0
Jordan	Tafilah	2018	79.5	100.0	100.0	68.0	99.6	96.4	99.9	100.0	100.0	68.1	99.3	...	99.9
Jordan	Zarqa	2018	73.4	100.0	100.0	85.9	99.9	97.7	100.0	99.6	99.4	71.8	98.6	...	99.7
Kazakhstan	Almaty City	2006	100.0	100.0	99.9	79.3	98.2	96.8	100.0	87.7	99.8	94.9	70.3	100.0	100.0
Kazakhstan	Astana	2011	97.9	99.9	99.9	75.3	99.1	90.8	100.0	93.0	97.1	100.0	98.9	...	99.8
Kazakhstan	Almaty City	2015	82.9	84.7	...	64.0	99.8	98.0	99.8	94.3	99.9	96.1	99.0	99.9	99.8
Kenya	Nairobi	2003	93.3	95.0	70.7	70.9	72.9	41.8	86.9	...	94.3	71.0	...	77.5	27.2
Kenya	Nairobi	2008	92.0	98.7	81.9	69.2	94.6	47.0	94.5	88.1	99.3	75.3	92.7	89.1	42.4
Kenya	Nairobi	2014	86.9	97.9	87.6	44.1	90.1	29.6	94.6	69.0	99.9	62.5	98.0	88.0	40.5
Kenya	Nairobi	2015	74.8	98.4	97.8	38.5	92.7	55.8	99.7	67.7	100.0	77.2	99.6	97.9	...
Kyrgyzstan	Bishkek City	2012	99.7	99.9	99.9	47.6	99.5	88.3	82.3	82.1	64.0	87.1	96.9	99.7	99.7
Kyrgyzstan	Osh City	2014	89.9	92.6	...	38.3	98.8	94.4	96.9	84.6	99.6	86.1	99.0	99.9	92.0
Lao People's Democratic Republic	Luang Prabang	2011	40.5	99.1	99.1	0.0	94.9	89.8	89.6	87.2	95.0	81.2	97.2	91.1	10.3
Lao People's Democratic Republic	Savannakhet	2011	5.6	81.8	81.8	0.2	75.4	68.9	92.8	80.2	96.8	66.0	93.2	96.9	3.3
Lao People's Democratic Republic	Vientiane	2011	15.3	99.5	99.0	3.0	99.3	95.6	99.1	95.5	99.7	87.5	99.3	99.4	26.0
Lesotho	Maseru	2000	85.4	90.4	73.1	5.5	67.3	...	84.4	...	...	78.2	...	17.9	...
Lesotho	Maseru	2004	95.0	98.3	88.0	11.9	49.6	25.8	95.5	...	...	...	...	39.1	75.6
Lesotho	Maseru	2009	83.0	91.0	72.0	3.3	59.4	23.6	97.4	93.9	99.4	71.0	90.3	47.0	79.7
Lesotho	Maseru	2014	97.9	99.0	90.9	4.6	95.3	45.1	95.3	95.6	97.5	78.9	95.9	67.9	84.9
Liberia	Monrovia	2007	24.7	90.7	84.6	9.9	53.2	27.6	91.0	74.6	93.9	55.6	74.3	8.4	0.1
Liberia	Monrovia	2009	33.8	97.5	...	9.3	66.4	0.0	90.6	88.1	92.8	43.3	82.1	5.5	...
Liberia	Monrovia	2011	24.2	85.8	73.6	1.7	60.8	23.7	90.7	88.5	97.8	49.6	85.0	12.5	0.6
Liberia	Monrovia	2013	9.0	95.1	86.5	2.9	70.2	33.7	90.4	93.9	99.8	56.9	94.5	28.3	0.2
Liberia	Monrovia	2016	19.3	99.1	90.5	3.5	84.2	37.4	95.6	96.3	99.9	56.4	90.3	48.8	0.4
Madagascar	Antananarivo	2008	92.0	98.1	91.3	0.9	25.9	15.0	79.4	93.6	97.4	50.2	81.9	81.3	5.5
Madagascar	Antananarivo	2011	87.0	96.6	...	0.0	1.6	1.1	71.4	89.4	78.5	41.6	60.7	53.0	0.1
Madagascar	Antananarivo	2013	75.9	93.7	...	0.7	35.7	13.9	79.9	72.3	77.8	50.6	75.3	69.6	0.9
Malawi	Lilongwe	2012	66.9	85.8	75.6	12.5	42.3	26.7	66.0	93.1	84.0	68.8	76.7	24.6	8.2
Malawi	Blantyre	2014	93.2	98.9	76.6	0.8	71.5	37.6	81.9	76.5	95.1	97.4	87.7	53.4	12.1
Malawi	Lilongwe	2014	91.3	99.4	91.6	5.5	99.8	50.3	85.0	90.7	94.3	100.0	87.8	51.0	14.0

Table B.2: Continued

			Water			Sanitation			Durable housing				Other basic services		
County	City	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Malawi	Mzuzu city	2014	93.9	99.7	99.4	1.0	96.6	66.4	76.6	82.0	85.8	93.2	94.8	50.9	7.3
Malawi	Zomba city	2014	91.7	94.9	88.0	0.3	91.8	56.4	67.1	76.3	80.5	85.7	84.6	44.5	12.1
Malawi	Blantyre	2016	79.5	97.2	77.9	2.5	98.1	34.6	78.6	82.4	95.5	86.6	85.3	55.3	7.7
Malawi	Lilongwe	2016	96.6	99.6	89.0	4.3	99.9	50.7	81.2	89.3	95.3	85.3	91.2	50.0	21.7
Maldives	Malé	2009	56.9	99.3	34.1	99.2	99.9	97.5	98.8	98.4	99.6	61.3	99.6	99.9	99.3
Mali	Bamako	2012	87.5	98.7	94.0	9.8	90.8	47.5	72.2	80.9	95.0	71.9	96.4	84.6	2.5
Mali	Bamako	2015	89.8	98.9	91.5	5.2	93.6	56.4	86.6	95.9	98.0	100.0	98.3	91.6	2.6
Mali	Bamako	2018	79.3	99.0	95.1	6.7	90.6	46.9	87.8	95.4	99.5	72.6	98.1	92.3	1.2
Mauritania	Nouakchott	2001	93.2	98.9	69.8	5.0	14.5	10.6	64.5	...	...	34.9	...	48.3	48.8
Mauritania	Nouakchott	2007	30.3	98.0	90.8	2.2	77.9	61.1	81.3	95.0	50.4	47.2	86.6	80.8	70.4
Moldova	Chisinau	2005	89.4	99.5	...	90.0	97.4	89.0	93.3	99.6	99.0	96.1	67.4	99.7	99.8
Mongolia	Ulaanbaatar	2005	43.1	99.2	88.7	35.3	96.2	63.0	21.1	53.5	49.7	49.0	67.8	98.9	39.6
Mongolia	Ulaanbaatar	2010	49.2	99.8	93.7	32.8	99.3	66.0	37.5	72.3	35.4	73.9	99.1	99.3	47.7
Morocco	Casablanca	2004	99.0	100.0	...	99.2	99.2	88.7	93.7	...	...	80.6	...	99.1	99.6
Morocco	Marrakech	2004	98.8	99.7	...	99.9	99.9	85.2	93.1	...	...	73.6	...	98.9	99.6
Mozambique	Maputo	2009	96.9	99.8	...	12.9	84.0	63.0	95.2	94.1	99.5	87.1	90.7	83.6	27.7
Mozambique	Maputo	2011	95.4	99.1	96.1	0.0	66.7	57.6	97.3	93.6	99.7	77.9	96.4	90.7	29.9
Mozambique	Maputo	2015	89.5	99.8	97.2	63.5	81.6	68.0	98.6	93.8	99.6	79.0	95.8	94.9	5.6
Mozambique	Maputo	2018	98.3	100.0	99.4	8.2	94.5	85.0	96.6	98.0	99.5	86.3	97.8	97.3	43.5
Myanmar	Naypyitaw	2016	10.1	98.7	95.5	1.0	93.8	70.7	62.1	44.7	98.1	76.1	95.0	95.6	61.8
Myanmar	Yangon	2016	8.9	95.4	79.9	1.4	78.5	65.9	62.3	66.8	99.1	63.2	97.1	98.5	75.6
Namibia	Windhoek	2000	96.9	97.0	82.6	79.3	79.7	55.8	88.1	...	...	71.4		74.9	79.5
Namibia	Windhoek	2007	96.6	97.7	85.1	87.1	89.1	67.7	91.1	86.7	87.1	81.4	87.7	86.8	89.6
Nepal	Kathmandu City	2006	60.6	99.6	87.7	67.8	96.6	36.5	92.1	98.6	99.2	63.0	42.6	...	70.0
Nepal	Kathmandu City	2016	56.2	99.7	96.0	55.8	95.7	55.2	94.4	94.8	14.2	87.8	97.6	...	91.2
Nicaragua	Managua	2001	97.9	98.3	70.0	50.8	81.0	75.1	77.6	81.8	99.3	59.5	21.5	99.5	75.2
Niger	Niamey	2006	91.3	94.2	89.8	10.7	44.8	23.3	70.2	...	...	52.1	50.7	61.6	3.5
Niger	Niamey	2012	95.0	97.3	86.0	5.9	84.4	33.9	83.3	56.9	67.0	61.1	89.3	73.5	4.8
Nigeria	Abuja	2013	51.1	99.6	97.7	41.8	95.2	65.5	95.5	97.2	99.8	72.8	97.5	93.2	42.3
Nigeria	Akure	2013	7.2	95.7	85.8	12.4	73.7	30.2	98.5	99.3	99.2	70.4	96.2	94.2	3.1
Nigeria	Ibadan	2013	6.9	97.7	93.0	1.8	67.6	20.5	99.6	99.6	100.0	65.3	95.6	78.4	1.8
Nigeria	Lagos	2013	21.8	95.5	96.1	7.6	85.5	30.0	98.6	98.9	99.5	54.9	97.4	99.5	10.8
Nigeria	Zaria	2013	24.9	82.5	89.6	12.9	92.4	29.1	83.1	81.6	97.7	78.6	92.9	89.7	3.9
Nigeria	Abuja	2015	34.3	98.7	100.0	67.8	100.0	87.5	86.8	95.8	77.7	81.0	98.5	94.5	38.6
Nigeria	Akure	2015	14.8	96.3	89.6	25.0	91.9	34.0	97.3	95.7	...	74.2	96.1	77.5	15.0
Nigeria	Ibadan	2015	3.5	97.7	97.3	2.2	88.8	45.6	93.1	87.4	96.3	76.9	94.8	85.7	9.7
Nigeria	Lagos	2015	20.8	98.5	96.8	29.3	92.3	33.9	99.5	98.7	70.0	48.5	94.8	99.7	18.7
Nigeria	Zaria	2015	14.6	85.4	84.3	15.9	72.8	60.9	70.3	77.2	95.8	79.7	62.2	66.7	3.1
Nigeria	Abuja	2018	45.7	97.9	93.6	0.6	93.9	53.8	99.1	99.4	97.8	60.2	97.9	93.6	31.3
Nigeria	Akure	2018	11.6	97.3	94.7	0.0	73.7	27.7	96.7	97.5	...	73.2	94.6	85.5	33.0
Occupied Palestinian Territory	Gaza	2010	7.6	99.9	...	99.2	99.9	95.7	99.6	...	...	77.7	0.4	...	99.0
Occupied Palestinian Territory	Bethlehem	2014	95.2	97.4	...	28.9	98.3	97.5	62.9	...	...	79.6	60.8	...	0.4
Occupied Palestinian Territory	Hebron	2014	86.6	99.5	...	36.1	99.7	98.6	58.8	99.2	99.8	74.3	44.5	99.7	1.0
Occupied Palestinian Territory	Jerusalem	2014	95.3	95.3	...	83.7	99.0	98.2	44.8	99.4	99.6	75.5	72.8	99.7	0.6
Pakistan	Islamabad	2012	65.2	98.9	78.7	90.8	97.5	93.8	93.5	96.5	90.2	44.9	95.4	99.9	91.6
Pakistan	Karachi	2018	58.6	98.4	94.7	80.7	94.3	87.9	89.4	93.8	92.3	42.0	96.1	99.6	87.5
Panama	Bocas del Toro	2013	85.9	98.7	43.8	9.1	73.4	69.1	60.1	96.6	...	71.0	90.2	87.2	...
Papua New Guinea	Port Moresby	2018	98.6	98.8	97.8	68.9	86.2	71.0	98.6	89.3	99.1	52.7	94.6	87.7	68.7
Paraguay	Asunción	2016	49.1	100.0	93.8	65.3	95.6	88.8	94.0	96.3	99.7	89.6	98.8	99.9	91.7
Paraguay	Resto	2016	82.0	99.1	50.3	7.7	94.8	91.5	95.6	97.4	98.0	89.8	98.5	99.8	77.6
Peru	Arequipa	2004	92.2	98.4	98.2	84.7	89.8	80.0	88.2	99.4	96.2	76.8	...	97.8	65.4
Peru	Chimbote	2004	91.9	91.9	91.0	78.1	83.4	70.2	61.4	67.8	94.9	83.0	...	87.5	60.5
Peru	Lima	2004	96.5	98.9	98.6	94.4	96.5	85.7	91.2	87.8	93.2	81.6	...	99.3	86.5
Peru	Piura	2004	93.7	94.4	76.6	36.0	59.6	59.5	59.6	74.2	99.3	70.0	...	91.7	72.0
Peru	Arequipa	2012	95.4	97.9	97.3	81.4	91.1	86.0	90.8	94.1	98.6	84.6	97.8	99.5	95.7
Peru	Chiclayo	2012	89.5	93.1	91.2	78.4	87.6	78.6	72.0	51.7	84.9	82.1	93.0	98.9	91.4
Peru	Chimbote	2012	95.7	97.0	97.0	87.3	93.1	85.4	81.2	72.1	84.7	87.9	93.0	97.6	84.4
Peru	Lima	2012	88.4	96.9	95.8	89.1	94.8	86.8	92.5	86.6	93.5	86.9	94.1	99.4	96.4
Peru	Piura	2012	82.3	91.1	87.1	65.5	78.2	70.9	63.0	76.1	99.2	82.5	86.2	97.6	72.9
Peru	Trujillo	2012	90.9	97.2	97.1	72.8	83.1	78.4	70.8	49.5	78.0	84.9	92.6	98.7	83.7
Philippines	Cagayan	2003	24.1	92.4	80.6	98.1	98.1	...	71.0	...	...	...	37.4	71.5	...
Philippines	Cebu	2003	64.3	96.6	85.8	84.0	84.7	...	69.6	...	...	...	46.6	90.4	...

Table B.2: Continued

			Water			Sanitation			Durable housing				Other basic services		
County	City	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Philippines	Metro Manila	2003	75.3	99.8	95.2	97.9	98.1	...	76.5	...	...	...	60.8	99.0	...
Philippines	Bacolod	2008	51.3	96.2	72.9	4.7	79.6	70.1	73.7	64.4	87.0	73.2	79.8	86.0	16.6
Philippines	Cagayan	2008	13.1	90.5	77.3	...	98.8	70.7	79.3	77.7	93.3	65.4	80.0	92.1	36.4
Philippines	Cebu	2008	25.9	99.5	...	...	85.5	57.8	78.1	71.8	98.6	66.9	83.1	94.4	41.5
Philippines	Metro Manila	2008	48.8	99.9	95.4	4.2	97.1	77.8	88.9	84.3	99.0	57.2	88.3	98.1	75.7
Philippines	Cebu	2013	13.7	99.8	94.7	2.4	87.1	68.9	81.9	70.9	94.1	69.1	88.4	89.2	36.6
Philippines	Metro Manila	2013	41.9	100.0	97.7	15.1	94.8	69.0	89.2	83.3	99.6	58.5	95.6	97.9	79.9
Rwanda	Kigali	2000	81.0	83.3	60.9	6.3	48.8	30.9	75.4	...	...	...	...	47.6	1.6
Rwanda	Kigali	2005	67.3	70.0	54.2	10.0	67.1	45.5	71.1	...	...	...	...	43.9	0.6
Rwanda	Kigali	2008	79.8	81.0	71.7	6.4	34.6	21.6	73.5	...	...	...	72.2	51.0	0.0
Rwanda	Kigali	2010	83.3	93.8	74.3	6.5	95.6	51.4	79.5	77.0	99.8	83.2	90.7	68.5	0.4
Rwanda	Kigali	2013	90.0	99.6	89.3	...	95.8	49.8	88.9	91.6	99.7	88.4	97.6	89.5	1.6
Rwanda	Kigali	2015	92.7	96.3	79.9	7.8	95.0	42.1	87.2	83.3	99.8	86.2	95.1	90.8	2.0
Rwanda	Kigali	2017	82.8	96.9	88.3	9.1	94.1	40.6	83.7	82.2	98.8	89.6	93.9	91.5	10.9
São Tomé and Príncipe	Santana	2009	97.4	99.4	66.5	4.5	19.4	11.0	98.8	...	...	84.6	41.2	70.3	...
São Tomé and Príncipe	São Tomé	2009	99.6	99.9	81.3	5.6	56.4	48.9	93.6	...	...	80.4	69.8	77.2	1.0
Senegal	Dakar	2014	98.9	100.0	94.7	23.8	96.4	67.0	95.6	98.1	94.0	57.5	97.0	95.0	56.7
Senegal	Dakar	2015	92.0	95.3	75.0	24.9	97.2	59.2	95.1	99.2	99.7	66.7	99.5	95.5	59.4
Senegal	Dakar	2016	95.5	99.3	65.5	19.5	96.3	65.0	95.0	99.1	99.6	76.2	99.4	93.8	68.4
Senegal	Dakar	2019	90.9	99.8	99.8	22.5	98.9	65.7	97.2	96.9	99.1	73.0	...	97.5	64.9
Serbia	Belgrade	2005	93.0	99.5	99.4	87.0	98.1	97.0	97.4	98.9	96.2	92.3	87.8	...	94.3
Serbia	Belgrade	2014	87.6	99.9	99.2	81.1	99.0	97.2	99.9	99.1	98.9	97.7	97.7	100.0	94.7
Sierra Leone	Freetown	2008	77.2	96.3	63.5	0.6	84.8	29.0	88.3	71.1	93.5	63.8	79.0	52.3	0.1
Sierra Leone	Freetown	2013	66.4	93.3	70.3	1.1	81.2	28.5	89.4	80.8	97.2	51.9	91.8	63.0	0.2
Sierra Leone	Freetown	2016	49.7	93.7	81.3	2.1	86.3	32.6	83.9	95.5	87.5	53.2	96.8	62.8	1.1
Suriname	Commewijne	2010	18.1	96.6	75.0	1.1	92.8	91.4	87.3	...	...	88.9	91.9	91.6	81.2
Tajikistan	Dushanbe	2005	94.7	95.9	...	70.0	99.3	91.2	90.2	83.5	92.8	87.9	33.7	99.8	92.0
United Republic of Tanzania	Arusha	2011	99.1	100.0	97.6	9.8	55.8	28.8	77.8	67.7	100.0	78.1	95.2	48.3	14.7
United Republic of Tanzania	Dar es Salaam	2011	59.3	95.4	93.1	0.6	75.8	31.7	96.4	99.7	100.0	80.5	93.8	66.5	2.6
United Republic of Tanzania	Dar es Salaam	2015	50.3	97.9	89.9	3.3	98.2	56.8	96.0	99.5	99.9	81.6	96.7	76.3	15.7
United Republic of Tanzania	Arusha	2017	86.3	99.2	99.2	...	93.4	56.8	85.4	72.6	99.6	88.1	96.7	65.8	32.8
United Republic of Tanzania	Dar es Salaam	2017	77.2	94.2	92.5	...	94.2	43.6	90.1	98.4	98.4	83.1	97.3	74.2	7.9
Thailand	Bangkok	2005	53.4	99.4	99.3	11.9	99.9	93.5	81.5	96.5	99.3	86.4	92.4	99.9	84.8
Timor-Leste	Dili	2009	66.5	98.7	96.8	19.4	93.8	73.2	83.2	75.8	99.1	73.4	87.7	98.6	12.8
Timor-Leste	Dili	2016	50.6	99.0	97.6	...	89.5	77.2	90.4	69.6	97.2	77.3	98.3	98.9	23.2
Togo	Lomé	2006	77.2	90.3	87.0	0.4	78.8	27.2	98.6	97.5	99.8	68.1	60.5	73.8	...
Togo	Lomé	2010	70.7	89.7		0.7	87.9	32.3	95.5	96.8	97.5	68.3	91.5	83.9	8.6
Togo	Lomé	2013	45.3	94.7	94.1	0.1	89.3	32.0	98.0	96.8	99.8	64.1	94.2	87.9	17.4
Togo	Lomé	2017	47.6	95.3	93.9	1.9	91.3	31.7	99.4	99.2	...	65.5	98.5	93.8	23.8
Trinidad and Tobago	Arima Borough	2000	94.4	94.4	...	68.7	93.8	85.8	...	98.1	...	96.3	...	...	...
Trinidad and Tobago	Port Fortin Borough	2000	83.4	88.4	19.5	...	51.0	47.7	...	97.9	...	85.5	...	...	...
Trinidad and Tobago	Tobago	2000	90.7	93.2	6.4	49.4	74.3	71.3	...	91.3	...	92.0	...	...	...
Trinidad and Tobago	Arima Borough	2006	96.7	98.6	...	45.2	97.9	93.8	97.3	95.7	...	95.0	90.9	99.4	...
Trinidad and Tobago	Port of Spain	2006	90.1	98.4	56.4	72.6	96.3	93.7	75.8	83.0	99.7	93.8	89.4	98.5	99.3
Trinidad and Tobago	Princes Town	2006	77.2	97.9	15.1	16.5	97.6	94.0	62.5	95.7	99.9	93.8	90.8	96.3	99.5
Turkey	Bursa	2004	73.4	96.1	...	100.0	100.0		91.7	...	...	91.7	83.2	...	...
Turkey	Instabul	2004	46.1	93.1	4.2	95.2	99.1	98.6	92.5	...	...	89.3	82.0	...	...
Turkey	Adana	2013	86.7	99.5	99.5	94.4	99.6	98.4	99.0	...	...	87.2	99.6	...	...
Turkey	Bursa	2013	64.8	99.3	99.1	97.8	99.7	98.7	99.2	...	...	96.7	98.2	...	...
Turkey	Gaziantep	2013	86.5	99.1	99.1	98.6	100.0	99.1	92.3	...	...	67.7	97.3	...	...
Turkey	Instabul	2013	31.3	99.7	99.3	99.8	99.8	98.7	95.1	...	...	94.2	99.2	...	...
Turkmenistan	Ashgabat city	2019	30.4	100.0	100.0	93.0	100.0	99.2	100.0	100.0	100.0	93.8	100.0	100.0	...
Uganda	Kampala	2011	84.6	97.6	94.4	12.9	94.2	23.4	94.0	88.3	99.4	63.8	94.1	79.9	6.2
Uganda	Kampala	2016	80.8	99.0	97.6	5.7	93.6	31.6	96.6	95.1	99.7	65.3	97.8	92.5	4.7
Uganda	Kampala	2019	81.1	98.7	97.3	0.6	86.6	31.6	98.3	94.6	99.0	55.2	98.7	95.1	4.5
Ukraine	Kyiv	2007	65.1	99.1	...	65.7	99.4	95.0	82.6	97.5	99.8	96.3	87.6	...	...
Vanuatu	Port Vila	2007	71.2	97.7	96.5	...	94.3	59.3	96.0	94.8	99.2	76.1	79.7	86.9	48.7
Viet Nam	Da Nang	2002	88.6	98.9		...	...	...	...	...	...	66.8	...	...	...
Viet Nam	Ho Chi Minh	2002	90.6	99.0	...	95.8	96.2	...	99.0	...	99.4	64.5	...	99.8	...
Viet Nam	Ha Noi	2005	86.9	99.7	...	97.4	97.4	87.5	...	...	99.7	88.7	...	...	73.6
Viet Nam	Hai Phong	2005	88.1	100.0	...	92.2	94.9	91.3	98.2	100.0	100.0	84.4	...	100.0	47.6
Viet Nam	Ho Chi Minh	2005	53.0	97.9	...	99.2	99.5	96.3	99.3	99.3	99.8	66.7	...	...	81.3

Table B.2: Continued

			Water			Sanitation			Durable housing				Other basic services		
County	City	Year	Connection to piped water	Improved water [a]	Basic drinking water services [b]	Connection to sewerage	Improved sanitation [c]	Basic sanitation services [d]	Durable floor [e]	Durable wall [f]	Durable roof [g]	Sufficient living area [h]	Mobile telephone	Connection to electricity	Clean cooking fuel
Yemen	Sana'a	2006	28.6	51.1	...	52.7	99.5	98.9	95.2	...	...	68.8	72.5	99.2	97.5
Yemen	Aden	2013	86.8	98.9	...	81.7	98.0	94.8	95.5	97.6	26.1	48.2	93.4	99.4	95.9
Yemen	Sana'a	2013	18.4	99.0	35.0	70.9	99.1	97.3	99.1	98.6	56.1	72.2	96.8	...	98.9
Zambia	Lusaka	2002	94.8	97.7	91.7	21.7	27.6	18.5	96.3	...	...	...	...	48.7	42.9
Zambia	Lusaka	2007	90.5	91.6	90.2	22.5	85.5	36.0	95.2	97.3	99.7	59.8	74.3	61.7	55.5
Zambia	Lusaka	2013	89.5	98.6	90.6	15.9	87.7	31.9	97.6	98.8	99.8	66.8	92.7	78.6	33.4
Zimbabwe	Bulawayo	2005	98.5	99.9	97.8	95.6	99.7	70.9	99.6	99.8	99.7	76.7	40.2	98.5	97.9
Zimbabwe	Harare	2005	95.4	99.1	98.6	87.3	98.5	65.5	99.1	99.4	99.7	77.3	41.8	88.5	86.9
Zimbabwe	Harare	2009	61.5	98.0	93.0	84.9	98.2	20.8	98.5	98.8	99.7	77.2	69.3	...	85.5
Zimbabwe	Bulawayo	2010	99.6	100.0	...	92.0	97.7	66.9	97.6	98.9	99.2	80.2	94.6	94.6	91.8
Zimbabwe	Harare	2010	65.4	92.9	90.3	70.8	94.3	43.6	97.8	97.5	98.9	76.0	93.0	82.7	76.1
Zimbabwe	Bulawayo	2015	99.1	99.8	99.8	95.0	98.9	66.6	96.6	100.0	99.7	80.9	96.5	96.2	90.3
Zimbabwe	Harare	2015	36.9	97.3	92.7	79.2	97.5	48.5	96.7	95.7	98.7	81.1	98.1	80.1	76.3

Notes:

[a] *Improved drinking water sources include: piped water into dwelling, plot or yard; public tap/stand pipe; protected spring; rainwater collection; bottled water (if secondary source is also improved); bore hole/tube well; and, protected dug well.*

[b] *Basic drinking water services refer to drinking water from an improved water source whose collection time is no more than 30 minutes for a round trip incluidng queuing.*

[c] *Improved sanitation facilities include : flush/pour-flush toilets or latrines connected to a sewer, septic tank or pit; ventilated improved pit latrine; pit latrine with a slab or platform which covers the pit entirely; and, composting toilets/latrines.*

[d] *Basic sanitation services are improved facilities that not shared with other households.*

[e] *Durable floor is floor made of the following materials: parquet, carpet, cement, bricks, tablets, mat, adobe, etc.*

[f] *Durable wall is wall made of finished materials such as covered adobe, bricks, cement blocks, wood planks, etc.*

[g] *Durable roof is roof made of finished materials such as metal, wood, ceramic tiles, cement, roofing shingles, etc.*

[h] *Proportion of population living in households in which not more than three people share the same habitable room.*

Source: United Nations Human Settlement Programme (UN-Habitat), Global Urban Indicators Database 2020.

Table B.3: Urban Population Living in Slum Households, by Country and Region, 2000-2018

Country	Proportion of Urban Population living in Slum Households (%)											Urban Population living in Slum Households (thousands)b										
	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020
World	31.2	30.9	30.1	29.2	28.2	27.3	26.3	25.4	24.6	24.4	24.2	894,875	928,034	946,516	961,109	969,070	980,512	983,965	992,179	999,526	1,028,017	1,059,936
Australia and New Zealand	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	26	27	24	22	19	16	13	9	7	7	8
Central Asia and Southern Asia	56.0	55.1	54.2	53.5	52.6	51.7	50.9	50.1	49.3	48.5	48.2	250,317	260,509	271,078	282,167	292,452	302,697	313,017	323,441	333,890	344,495	359,331
Eastern and South-Eastern Asia	37.5	35.9	34.2	32.4	30.6	28.8	27.1	25.3	23.6	22.4	21.7	313,358	320,173	325,835	328,456	328,509	326,680	322,500	316,089	307,327	305,119	306,620
Europe and Northern America	1.4	1.4	1.3	1.2	1.0	0.9	0.9	0.8	0.8	0.8	0.7	10,725	10,479	9,923	9,161	8,354	7,651	7,010	6,365	7,136	6,658	5,909
Latin America and The Carbbean	31.9	30.2	28.2	26.2	23.4	21.8	19.2	18.4	17.0	17.9	17.7	126,505	124,436	119,964	115,414	106,542	102,279	93,048	91,470	87,229	94,201	95,502
Oceania (Exc. Australia and New Zealand)	17.0	16.0	16.0	15.9	15.7	15.5	15.3	15.0	14.8	15.0	15.3	331	323	334	345	353	362	369	377	387	408	431
Sub Saharan Africa	64.1	63.4	61.6	60.2	58.7	57.3	55.7	54.2	52.7	51.3	50.2	129,979	139,265	146,916	155,638	164,932	174,946	185,179	195,587	206,152	217,647	230,080
Western Asia and Northern Africa	31.6	34.4	32.6	29.8	27.4	25.2	22.8	20.3	18.8	18.7	18.7	63,633	72,821	72,440	69,907	67,907	65,881	62,830	58,841	57,399	59,482	62,056
Afghanistan	...	...	...	63.6	63.6	64.8	67.2	69.7	72.1	73.3	73.3	...	...	...	3,772	4,048	4,431	4,987	5,613	6,254	6,797	7,260
Albania	28.1	25.5	23.0	20.5	17.9	15.4	12.9	10.3	7.8	5.3	2.8	366	346	325	299	268	236	205	170	133	94	51
Algeria	...	...	...	...	30.8	30.8	28.9	25.0	21.1	17.2	13.3	...	...	...	...	7,097	7,513	7,478	6,861	6,115	5,239	4,238
Angola	19.7	19.7	19.7	25.8	31.9	38.1	44.2	50.3	56.4	62.6	62.6	1,622	1,816	2,034	2,967	4,048	5,317	6,794	8,497	10,434	12,617	13,733
Argentina	20.3	19.6	18.8	18.1	17.4	16.7	15.9	...	...	...	...	6,703	6,636	6,557	6,464	6,357	6,241	6,114	...	...	...	...
Armenia	12.8	12.3	11.8	11.3	10.8	10.4	9.9	9.4	8.9	8.4	8.4	254	240	227	214	201	189	180	172	164	156	156
Austria	4.5	4.4	4.4	4.4	...	...	...	...	...	...	...	219	214	214	213	...	...	...	...	...	...	...
Azerbaijan	50.9	44.9	38.9	32.9	26.9	26.9	26.9	...	...	...	...	2,126	1,926	1,717	1,495	1,259	1,299	1,344	...	...	...	...
Bangladesh	58.3	57.7	57.0	56.4	55.7	55.1	54.4	53.8	53.2	52.5	51.9	18,100	19,501	21,042	22,552	24,025	25,533	27,126	28,760	30,389	32,004	33,619
Belarus	17.6	16.0	14.5	13.0	11.4	9.9	8.4	6.9	5.3	3.8	2.3	1,220	1,115	1,009	905	802	702	601	499	393	283	170
Belize	15.8	15.8	15.8	15.8	15.7	15.7	15.7	15.7	15.7	15.7	15.7	18	19	20	21	22	23	24	25	26	28	29
Benin	71.9	71.5	71.1	70.7	70.3	69.9	69.5	69.1	68.7	68.3	67.9	1,891	2,035	2,206	2,384	2,572	2,771	2,984	3,211	3,454	3,713	3,987
Bolivia	57.9	55.7	53.4	51.2	48.9	46.6	46.6	46.6	...	...	...	2,986	3,025	3,052	3,069	3,076	3,072	3,214	3,351	...	...	...
Bosnia & Herzegovina	5.1	5.1	5.1	4.9	4.7	4.5	4.3	4.0	4.0	4.0	...	81	83	84	82	79	76	72	67	67	68	-
Botswana	58.7	56.6	54.4	52.3	50.2	48.1	46.0	43.8	41.7	39.6	39.6	540	549	553	556	581	605	622	631	638	641	678
Brazil	34.7	31.4	28.1	24.8	21.5	18.2	14.9	14.9	14.9	...	...	49,441	46,366	42,877	39,002	34,766	30,213	25,373	26,008	26,617	...	...
Burkina Faso	82.2	76.6	71.1	65.5	59.9	54.4	48.8	43.2	37.7	32.1	26.6	1,703	1,814	1,923	2,024	2,072	2,090	2,084	2,049	1,977	1,862	1,699
Burundi	79.7	79.7	77.0	71.7	66.3	61.0	55.6	50.2	44.9	39.5	36.8	421	466	506	529	551	569	580	585	585	577	602
Cambodia	84.8	79.2	73.6	67.9	62.3	56.6	51.0	45.4	39.7	39.7	39.7	1,915	1,883	1,832	1,765	1,692	1,644	1,585	1,511	1,413	1,508	1,608
Cameroon	65.4	62.1	58.8	55.6	52.3	49.0	45.7	42.5	39.2	35.9	32.7	4,547	4,668	4,783	4,887	4,978	5,047	5,089	5,099	5,071	5,000	4,882
Central Africa Republic	86.0	83.1	80.3	77.4	74.6	71.8	68.9	68.9	68.9	...	...	1,215	1,228	1,236	1,243	1,248	1,242	1,219	1,243	1,286	...	...
Chad	91.6	90.5	89.3	88.2	87.1	85.9	84.8	83.7	82.6	82.0	82.0	1,653	1,767	1,888	2,007	2,123	2,246	2,386	2,541	2,706	2,903	3,141
Chile	14.6	11.0	7.3	7.3	7.3	...	...	...	...	...	...	1,920	1,484	1,015	1,035	1,058	...	...	...	...	...	...
Colombia	21.2	19.8	18.5	17.1	15.8	14.5	13.1	11.8	10.4	9.7	9.7	6,328	6,167	5,973	5,743	5,477	5,175	4,837	4,466	4,062	3,876	3,967
Comoros	64.5	65.1	65.7	66.3	66.9	67.5	68.0	68.6	68.6	68.6	...	98	104	109	116	123	130	139	148	156	165	...
Congo	87.8	87.8	84.7	78.5	72.2	66.0	59.8	53.5	47.3	44.2	44.2	1,662	1,784	1,848	1,852	1,853	1,831	1,777	1,697	1,600	1,597	1,704
Costa Rica	12.7	11.8	10.9	10.0	9.0	8.1	7.2	6.3	5.4	4.5	3.5	294	296	293	287	278	265	248	227	203	175	144
Cote d'Ivoire	67.1	65.5	64.0	62.5	60.9	59.4	57.8	56.3	54.8	53.2	53.2	4,830	5,006	5,162	5,332	5,522	5,733	5,967	6,217	6,471	6,729	7,201
Cuba	2.2	2.2	2.2	3.2	4.3	5.3	6.3	7.4	8.4	9.5	10.5	181	183	185	276	367	460	555	650	746	840	935
Democratic Republic of Congo	...	71.9	71.9	72.4	73.3	74.2	75.1	76.1	77.0	77.9	78.4	...	12,922	14,111	15,539	17,248	19,161	21,292	23,652	26,249	29,095	32,010
Dominican Republic	30.2	27.8	25.4	23.1	20.7	18.3	16.0	13.6	11.2	11.2	11.2	1,595	1,556	1,528	1,485	1,422	1,339	1,230	1,100	952	993	1,031
Ecuador	57.4	57.8	57.8	57.8	...	...	...	...	...	...	...	4,372	4,622	4,803	4,998	...	...	...	...	...	...	...
Egypt	42.2	36.7	31.2	25.7	20.2	14.7	9.2	3.7	0.9	0.9	...	12,633	11,431	10,111	8,651	7,036	5,310	3,456	1,438	368	382	...
El Salvador	...	49.5	49.5	46.5	40.5	34.5	28.5	22.5	16.5	16.5	16.5	...	1,765	1,815	1,751	1,575	1,391	1,191	973	737	762	785
Eswatini	55.4	55.4	55.4	47.9	40.5	33.1	25.7	18.2	10.8	10.8	10.8	133	134	134	118	103	89	73	55	34	36	38
Ethiopia	92.2	89.1	86.0	82.9	79.8	76.7	73.6	70.5	67.4	64.3	64.3	9,040	9,493	9,948	10,391	10,958	11,649	12,356	13,042	13,713	14,360	15,733
Fiji	...	15.0	15.0	14.5	13.5	12.5	11.4	10.4	9.4	9.4	9.4	...	60	61	60	58	56	53	50	47	48	50
Gabon	57.4	55.6	53.7	51.8	49.9	48.1	46.2	44.3	44.3	44.3	...	558	578	599	622	647	674	703	729	777	819	...
Gambia	56.9	55.1	53.3	51.5	49.7	47.9	46.1	44.3	42.5	40.7	38.9	336	359	382	405	428	451	474	497	519	540	558
Georgia	13.6	13.6	13.2	12.4	11.7	10.9	10.1	9.4	8.6	7.8	7.1	338	330	319	298	278	256	235	214	196	180	164
Ghana	60.4	57.0	53.6	50.3	46.9	43.6	40.2	36.8	33.5	33.5	33.5	5,022	5,143	5,250	5,336	5,396	5,416	5,388	5,307	5,171	5,531	5,902
Guatemala	55.5	53.3	51.0	48.8	46.5	44.3	42.1	39.8	37.6	37.6	37.6	2,931	2,991	3,044	3,086	3,117	3,138	3,148	3,149	3,138	3,310	3,491
Guinea	40.7	41.5	42.3	43.2	44.0	44.8	45.7	46.5	47.3	48.2	49.0	1,106	1,191	1,285	1,388	1,504	1,630	1,765	1,913	2,081	2,272	2,485
Guinea-Bissau	...	...	...	...	75.2	75.2	75.2	71.6	68.0	64.4	60.8	...	...	...	...	438	469	504	516	525	533	538
Guyana	26.1	26.1	25.3	23.7	22.0	20.4	18.7	17.1	15.4	13.8	12.1	56	56	53	49	45	41	37	34	32	29	26
Haiti	61.3	60.0	58.7	57.4	56.1	54.8	53.4	52.1	50.8	49.5	48.9	1,865	2,063	2,230	2,354	2,478	2,601	2,721	2,836	2,945	3,043	3,174
Honduras	44.4	44.4	43.2	40.9	38.6	36.2	33.9	31.5	31.5	31.5	...	1,317	1,420	1,493	1,519	1,535	1,540	1,533	1,515	1,602	1,694	...
Hungary	15.4	14.2	12.9	11.6	10.4	9.1	7.9	7.2	7.2	...	...	1,016	940	860	780	706	623	543	496	497	...	...
India	55.3	54.6	53.9	53.2	52.5	51.8	51.1	50.4	49.7	49.0	49.0	161,101	168,051	175,430	182,790	190,103	197,240	204,193	211,207	218,417	225,832	236,771
Indonesia	35.1	33.5	31.8	30.2	28.5	26.9	25.2	23.5	21.9	20.2	19.4	31,210	31,719	32,123	32,401	32,542	32,508	32,160	31,620	30,862	29,872	29,929
Iraq	33.9	35.4	37.0	38.5	40.1	41.6	43.2	44.7	46.2	47.8	49.3	5,471	6,063	6,688	7,344	8,041	8,847	9,822	10,917	12,061	13,250	14,517
Ireland	6.2	6.4	6.7	6.9	7.2	7.5	7.7	8.0	8.3	8.5	8.5	141	152	167	180	198	214	223	234	246	258	264
Jordan	40.0	37.7	35.4	33.0	30.7	28.4	26.0	23.7	21.4	19.1	16.7	1,598	1,560	1,533	1,587	1,667	1,754	1,835	1,880	1,830	1,717	1,561
Kazakhstan	24.5	21.7	18.9	16.1	13.3	10.5	7.8	5.0	2.2	0.8	0.8	2,066	1,841	1,639	1,429	1,208	982	748	496	225	84	86
Kenya	63.2	61.6	60.1	58.5	57.0	55.5	53.9	52.4	50.8	50.8	50.8	3,953	4,216	4,491	4,782	5,088	5,405	5,735	6,078	6,428	6,998	7,609

Table B.3: Continued

Country	Proportion of Urban Population living in Slum Households (%)											Urban Population living in Slum Households (thousands)b										
	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020
Kyrgyzstan	47.2	42.7	38.2	33.7	29.3	24.8	20.3	15.9	11.4	6.9	2.4	819	752	679	610	544	475	403	326	244	154	57
Lao People's Democratic Republic	54.4	51.0	47.5	44.1	40.7	37.3	33.8	30.4	27.0	23.6	21.8	637	674	706	716	712	700	678	649	616	575	567
Lebanon	...	92.4	92.4	92.4	67.3	42.2	17.1	4.5	4.5	...	...	...	2,807	3,088	3,253	2,408	1,598	736	222	239	...	...
Lesotho	62.7	62.7	58.6	54.5	50.3	46.2	42.1	37.9	33.8	29.7	25.6	229	246	246	244	240	234	226	216	204	189	172
Liberia	...	75.5	75.5	74.6	72.8	71.0	69.2	67.5	65.7	63.9	63.9	...	1,041	1,096	1,168	1,256	1,341	1,407	1,463	1,523	1,586	1,698
Madagascar	91.4	89.0	86.6	84.2	81.8	79.4	77.0	74.6	72.2	69.8	67.4	3,910	4,129	4,351	4,679	5,019	5,366	5,719	6,079	6,447	6,820	7,194
Malawi	81.4	77.9	74.4	70.9	67.4	63.8	60.3	56.8	53.3	49.8	49.8	1,353	1,384	1,411	1,441	1,473	1,505	1,536	1,564	1,592	1,616	1,760
Maldives	...	...	41.5	41.5	41.0	39.9	38.7	37.6	36.5	35.4	34.8	...	...	42	47	50	53	56	59	61	63	65
Mali	83.9	79.7	75.5	71.3	67.1	62.9	58.7	54.5	50.3	46.1	41.9	2,609	2,764	2,928	3,096	3,264	3,414	3,533	3,624	3,693	3,733	3,734
Mauritania	84.7	81.3	77.9	74.6	71.2	67.8	64.4	61.1	57.7	56.0	56.0	874	922	978	1,033	1,086	1,140	1,194	1,246	1,289	1,365	1,482
Mexico	32.2	30.4	28.7	27.0	25.3	23.6	21.9	20.2	18.4	17.6	17.6	24,446	23,947	23,364	22,789	22,209	21,534	20,721	19,780	18,718	18,447	19,021
Mongolia	57.6	53.6	49.7	45.7	41.7	37.7	33.8	29.8	25.8	21.9	17.9	789	777	762	743	719	692	647	594	534	467	394
Montenegro	19.1	19.1	18.5	17.3	16.1	14.9	13.6	12.4	11.2	10.0	8.8	69	71	71	67	63	60	55	51	47	42	37
Morocco	33.2	30.4	27.6	24.8	22.0	19.2	16.4	13.6	10.9	10.9	10.9	5,101	4,839	4,548	4,266	3,955	3,613	3,238	2,820	2,349	2,453	2,556
Mozambique	90.1	86.6	83.1	79.6	76.0	72.5	69.0	65.5	62.0	58.5	55.0	4,737	4,881	5,031	5,174	5,356	5,592	5,820	6,038	6,241	6,424	6,583
Myanmar	29.4	32.6	35.8	39.0	42.2	45.4	48.7	51.9	55.1	58.3	58.3	3,662	4,210	4,780	5,363	5,957	6,584	7,260	7,984	8,761	9,598	9,947
Namibia	42.6	42.4	42.3	42.1	42.0	41.8	41.7	41.5	41.4	41.4	...	262	281	303	326	350	378	412	451	492	536	...
Nepal	66.3	63.4	60.5	57.6	54.7	51.9	49.0	46.1	43.2	40.3	40.3	2,109	2,218	2,273	2,312	2,334	2,350	2,363	2,372	2,370	2,356	2,508
Nicaragua	71.6	70.3	69.1	67.8	67.2	67.2	...	...	...	...	...	1,986	2,018	2,046	2,075	2,125	2,195	...	...	...	...	...
Niger	70.0	70.1	70.2	70.2	70.3	70.3	70.4	70.4	70.4	70.4	...	1,287	1,391	1,496	1,611	1,737	1,874	2,023	2,188	2,372	2,582	...
Nigeria	74.1	71.6	69.1	66.6	64.1	61.5	59.0	56.5	54.0	51.5	49.0	31,590	33,631	35,741	37,921	40,163	42,435	44,684	46,858	48,901	50,779	52,466
Pakistan	71.2	69.7	68.2	66.6	65.1	63.6	62.1	60.5	59.0	57.5	56.0	32,539	33,653	34,724	35,790	36,862	37,962	39,102	40,241	41,319	42,336	43,345
Panama	48.7	44.4	40.1	35.7	31.4	27.1	22.8	18.5	16.3	16.3	...	917	877	830	776	713	644	566	479	441	459	...
Paraguay	42.0	39.0	36.0	33.0	30.0	27.0	24.0	21.0	18.0	15.1	15.1	1,233	1,217	1,178	1,126	1,065	995	919	834	741	639	663
Peru	47.4	45.6	43.7	41.9	40.0	38.2	36.3	34.5	...	...	...	8,975	8,951	8,900	8,826	8,717	8,569	8,413	8,240	...	...	...
Philippines	50.0	48.6	47.2	45.8	44.3	42.9	41.5	40.1	38.7	37.3	36.6	17,981	18,161	18,288	18,331	18,295	18,246	18,393	18,517	18,595	18,645	19,043
Republic Moldova	26.5	23.7	20.8	18.0	15.1	12.3	9.4	6.5	6.5	6.5	...	496	433	373	319	265	214	163	112	112	112	...
Rwanda	71.4	67.9	64.5	61.0	57.5	54.0	50.5	47.1	43.6	40.1	38.3	856	973	961	950	945	937	924	906	886	863	875
Sao Tome and Principe	...	...	61.4	61.4	60.4	58.5	56.5	54.6	52.6	52.6	52.6	-	-	54	59	63	66	69	72	75	80	85
Senegal	67.2	63.6	60.0	56.5	52.9	49.4	45.8	42.3	38.7	35.2	31.6	2,676	2,685	2,717	2,750	2,774	2,792	2,801	2,794	2,762	2,704	2,616
Sierra Leone	73.9	73.9	72.5	69.8	67.1	64.3	61.6	58.9	56.1	53.4	50.6	1,202	1,323	1,444	1,523	1,575	1,615	1,652	1,685	1,711	1,733	1,749
South Africa	27.6	27.2	26.8	26.5	26.1	25.7	25.3	24.9	24.6	24.2	24.2	7,183	7,414	7,642	7,849	8,042	8,250	8,492	8,749	8,990	9,210	9,571
South Sudan	...	99.8	99.8	99.8	99.8	97.0	94.2	94.2	94.2	...	...	-	1,211	1,323	1,461	1,623	1,744	1,856	2,023	2,200	...	...
State of Palestine	...	30.0	30.0	29.1	27.2	25.3	23.4	21.4	19.5	19.5	19.5	...	734	766	780	771	762	748	731	708	750	796
Sudan	...	99.1	99.1	99.1	94.0	88.9	83.8	78.7	73.7	73.7	73.7	...	9,266	9,784	10,277	10,198	10,117	10,061	10,012	9,948	10,598	11,313
Suriname	7.4	8.3	9.1	9.9	10.8	11.6	12.5	13.3	14.1	15.0	15.8	23	27	30	33	37	41	44	48	52	56	60
Tajikistan	60.3	55.7	51.2	46.6	42.1	37.5	33.0	28.4	23.9	19.3	17.1	993	952	911	865	816	761	700	634	560	478	445
Thailand	15.6	15.6	15.1	14.1	13.0	12.0	10.9	9.9	8.9	7.8	6.8	3,084	3,373	3,547	3,577	3,572	3,530	3,373	3,181	2,959	2,706	2,426
Timor-Leste	...	...	56.1	56.1	54.0	50.0	46.0	42.0	37.9	33.9	33.9	...	...	144	155	157	154	151	148	144	137	147
Togo	69.3	66.0	62.8	59.5	56.3	53.1	49.8	46.6	43.3	40.1	38.5	1,133	1,172	1,207	1,239	1,269	1,295	1,317	1,332	1,339	1,336	1,382
Trinidad and Tobago	11.1	11.1	11.1	10.3	9.5	8.7	7.9	7.5	7.5	...	...	78	78	79	73	68	63	57	54	55	...	...
Tunisia	...	...	...	10.4	10.4	10.1	9.6	9.1	8.6	8.1	7.6	...	...	...	695	715	719	706	691	674	655	633
Turkey	24.6	23.2	21.8	20.4	19.0	17.6	16.2	14.8	14.1	14.1	...	10,064	9,965	9,817	9,602	9,324	9,021	8,704	8,344	8,327	8,695	...
Turkmenistan	10.5	10.5	10.5	10.3	10.0	9.8	9.5	9.3	9.0	8.8	8.5	218	224	231	233	236	241	246	253	259	264	269
Uganda	80.9	78.2	75.5	72.8	70.1	67.5	64.8	62.1	59.4	56.7	54.0	2,876	3,143	3,437	3,750	4,083	4,434	4,803	5,184	5,575	5,968	6,360
Ukraine	5.0	5.0	4.6	3.9	3.2	2.5	1.8	1.1	1.1	1.1	...	1,640	1,614	1,468	1,236	1,010	785	561	341	338	336	...
United Republic of Tanzania	81.3	77.1	72.8	68.6	64.3	60.0	55.8	51.5	47.3	43.0	40.9	6,201	6,412	6,746	7,097	7,450	7,781	8,075	8,317	8,493	8,584	9,040
Uruguay	23.7	23.7	23.7	19.9	16.2	12.5	8.8	5.0	...	...	...	724	730	733	622	511	398	282	164	...	...	...
Venezuela	27.8	26.4	25.7	25.7	...	...	...	...	...	...	...	5,965	5,896	5,949	6,159	...	...	...	...	...	...	...
Vietnam	45.3	40.4	35.4	30.5	25.5	20.6	15.7	10.7	5.8	5.8	5.8	8,868	8,441	7,896	7,235	6,451	5,543	4,496	3,282	1,882	1,998	2,118
Yemen	63.8	61.2	58.6	55.9	53.3	50.7	48.1	45.5	44.2	44.2	...	2,996	3,162	3,328	3,491	3,650	3,803	3,948	4,077	4,315	4,683	...
Zambia	63.8	62.2	60.7	59.1	57.6	56.0	54.5	52.9	51.4	49.8	48.3	2,338	2,455	2,593	2,738	2,890	3,054	3,231	3,421	3,617	3,817	4,023
Zimbabwe	27.5	26.9	26.3	25.7	25.1	24.5	23.9	23.4	22.8	22.2	21.6	1,136	1,164	1,154	1,146	1,144	1,148	1,157	1,170	1,187	1,207	1,229

Notes:

(a) A "slum household" is a household in which the inhabitants suffer one or more of the following "household deprivations": 1) Lack of access to improved water services, 2) Lack of access to improved sanitation facilities, 3) Lack of sufficient living area, 4) Lack of housing durability and 5) Lack of security of tenure. For these calculations, only the first four deprivations were used.

(b) Slum population calculated based on World Urbanization Prospects: The 2018 Revision

Source: United Nations Human Settlement Programme (UN-Habitat), Global Urban Indicators Database 2020

Table C.1: Access to Convenient Transport and Open Space Indicators in Selected Cities (%), 2020

		Access to Convenient Transport	Access to Open Space			
Country	Cities	Proportion of population living within convenient walking distance to public transport (%)	Share of urban area allocated to open public space (%)	Share of urban area allocated to streets (%)	Share of urban area allocated to streets & open public space (%)	Proportion of population living within convenient walking distance to open public space (%)
Afghanistan	Charikar	77.5	2.2	9.9	12.1	82.1
Afghanistan	Farah	69.5	2.8	9.4	12.2	62.5
Afghanistan	Herat	50.4	2.7	7.2	9.9	55.6
Afghanistan	Jalalabad	44.2	2.2	13.4	15.7	59.0
Afghanistan	Kabul	19.1	0.5	13.0	13.5	13.0
Afghanistan	Kandahar	43.1	4.1	5.2	9.2	45.9
Afghanistan	Khan Abad	82.4	3.2	9.4	12.6	75.2
Afghanistan	Lashkar Gah	56.3	3.1	9.9	13.1	70.5
Afghanistan	Mazar-e Sharif	57.8	1.6	13.7	15.3	65.6
Afghanistan	Pol-e Khomri	49.0	2.4	7.2	9.6	56.1
Algeria	Algiers	48.0	2.5	12.4	14.9	41.2
Algeria	Annaba	15.4	3.1	11.7	14.8	49.6
Algeria	Batna	45.1	1.9	17.6	19.5	42.0
Algeria	Blida	41.1	2.0	12.7	14.7	54.0
Algeria	Chlef	26.6	3.7	10.9	14.5	62.7
Algeria	Djelfa	25.1	3.4	21.3	24.7	70.6
Algeria	El Khroub	34.1	3.1	11.9	15.0	67.5
Algeria	Khemis Miliana	43.2	1.8	16.2	18.1	74.5
Algeria	Mila	52.4	4.0	16.1	20.1	81.6
Algeria	M'Sila	50.9	2.8	14.2	17.0	65.3
Algeria	Oran	45.0	2.4	16.6	19.0	56.5
Algeria	Tamanrasset	32.2	4.0	12.8	16.8	67.6
Algeria	Tebessa	15.3	3.7	10.6	14.4	34.9
Algeria	Tiaret	38.4	1.5	18.1	19.6	32.1
Algeria	Tolga	95.7	2.5	15.0	17.6	81.4
Angola	Luanda	10.7	0.6	18.4	19.0	17.3
Argentina	Bahia Blanca	34.7	3.7	15.5	19.1	76.0
Argentina	Buenos Aires	87.3	1.8	21.6	23.4	49.5
Argentina	Catamarca	59.6	1.5	13.1	14.6	82.9
Argentina	Comodoro Rivadavia	81.5	1.7	17.7	19.4	61.7
Argentina	Concordia	54.5	1.5	12.0	13.5	67.5
Argentina	Cordoba	86.8	2.2	13.8	16.0	72.0
Argentina	Formosa	51.4	3.6	13.1	16.7	79.7
Argentina	La Plata	40.2	2.3	16.3	18.6	55.3
Argentina	Mendoza	94.6	2.2	17.4	19.5	74.8
Argentina	Neuquén	98.0	3.1	25.9	29.0	91.1
Argentina	Oberá	90.6	2.4	13.4	15.7	80.3
Argentina	Paraná	25.3	3.4	12.5	15.9	48.7
Argentina	Río Cuarto	65.4	3.4	18.1	21.4	77.1
Argentina	Rio Gallegos	72.1	2.6	4.4	6.9	84.4
Argentina	Rosario	90.6	5.0	15.4	20.3	52.8
Argentina	San Juan	15.7	2.9	14.6	17.5	59.1
Argentina	San Martín	18.7	2.8	13.3	16.1	64.1
Argentina	San Miguel de Tucumán	18.5	3.7	11.9	15.7	43.6
Argentina	San Pedro de Jujuy	21.5	4.7	18.4	23.1	92.5
Argentina	San Salvador de Jujuy	68.1	4.3	16.0	20.3	80.7
Argentina	Santiago del Estero	42.0	1.6	15.1	16.7	71.3
Argentina	Zárate	45.8	2.6	14.0	16.7	54.0
Australia	Adelaide	92.5	6.2	12.6	18.8	72.2
Australia	Alice Springs	94.6	9.3	21.0	30.3	92.4
Australia	Brisbane	89.1	8.0	12.0	20.1	80.5
Australia	Bunbury	93.9	11.4	12.2	23.6	96.8
Australia	Cairns	77.2	11.9	11.9	23.9	97.8
Australia	Canberra	84.8	14.5	15.2	29.7	97.5
Australia	Cessnock	93.5	2.8	17.6	20.5	54.0
Australia	Darwin	91.6	7.1	10.1	17.2	86.7
Australia	Geelong	89.7	8.9	11.1	20.0	88.9
Australia	Gold Coast	82.8	13.5	14.9	28.4	94.3
Australia	Hobart City	95.1	7.0	19.2	26.2	73.9
Australia	Kingaroy	55.7	4.3	9.0	13.3	75.1
Australia	Laucenston	93.3	7.5	17.6	25.0	81.0
Australia	Melbourne	88.9	8.5	11.9	20.4	84.4
Australia	Muswellbrook	66.2	7.7	7.9	15.6	80.8
Australia	Perth	45.4	7.6	13.6	21.2	85.6
Australia	Shepparton	91.8	6.7	18.8	25.5	92.3
Australia	Sydney	69.6	2.3	11.2	13.5	33.4
Australia	Wollongong	90.6	5.1	14.0	19.2	80.6
Austria	Vienna	97.5	3.2	11.7	14.9	72.4
Azerbaijan	Baku	83.1	4.0	19.3	23.3	57.0
Bahrain	Manama	21.2	1.5	22.1	23.5	17.8
Bangladesh	Barisal	58.6	1.0	4.1	5.2	59.6
Bangladesh	Bogra	37.4	1.9	7.7	9.6	79.8
Bangladesh	Chittagong	61.9	1.4	13.7	15.1	64.8
Bangladesh	Comilla	19.9	1.4	5.5	7.0	25.6
Bangladesh	Dhaka	44.8	1.3	12.2	13.5	31.4
Bangladesh	Dinajpur	76.0	1.9	4.2	6.2	82.0
Bangladesh	Gazipur	21.9	0.7	5.2	5.8	26.8
Bangladesh	Jamalpur	54.8	2.8	3.1	5.9	54.5
Bangladesh	Jessore	67.9	0.9	8.5	9.5	62.8
Bangladesh	Khulna	68.3	1.6	10.5	12.0	65.3
Bangladesh	Mymensingh (Nasirabad)	35.4	0.5	7.5	8.0	29.6
Bangladesh	Rajshahi	59.7	2.1	6.7	8.8	83.6
Bangladesh	Saidpur	60.1	1.9	4.1	6.0	75.3
Bangladesh	Sylhet	56.3	1.2	9.4	10.5	71.3
Belarus	Babrujsk	87.9	2.3	11.8	14.1	46.7
Belarus	Brest	79.8	2.6	13.4	16.1	50.2
Belarus	Gomel	78.7	2.3	12.3	14.6	42.1
Belarus	Hrodna	93.0	3.4	20.2	23.6	76.5
Belarus	Kobyrn	54.9	2.5	10.8	13.3	33.7
Belarus	Mazyr	75.7	2.1	13.8	16.0	47.4
Belarus	Minsk	91.0	11.5	19.0	30.5	83.3
Belarus	Polack	86.2	2.3	12.5	14.8	50.8
Belarus	Salihorsk	93.7	6.0	29.0	35.0	77.1
Belarus	Viciebsk	91.4	3.7	20.7	24.4	69.0
Belgium	Antwerpen**	95.3	5.0	17.1	22.1	64.4
Benin	Bohicon	22.5	0.6	11.6	12.1	36.6
Benin	Cotonou	34.2	0.8	8.5	9.3	50.1
Benin	Djougou	24.5	1.5	12.0	13.5	40.7
Benin	Kandi	58.4	1.4	12.4	13.7	70.4
Benin	Natitingou	56.6	1.6	9.4	10.9	65.6
Benin	Parakou	46.2	1.4	9.0	10.4	81.9
Benin	Porto Novo	54.5	1.0	7.3	8.2	52.8
Bhutan	Thimphu	33.5	2.6	11.9	14.5	30.5
Bolivia (Plurinational State of)	Cochabamba	27.2	1.8	16.0	17.8	63.6
Brazil	Aparecida de Goiânia	87.1	4.7	17.6	22.3	52.8
Brazil	Araxá	42.6	4.5	19.7	24.2	82.9
Brazil	Barretos	67.9	5.2	20.4	25.6	95.5
Brazil	Belem	31.2	3.0	15.9	18.9	29.3
Brazil	Belo Horizonte	85.8	5.3	16.5	21.8	41.6

Table C.1:Continued

		Access to Convenient Transport	Access to Open Space			
Country	Cities	Proportion of population living within convenient walking distance to public transport (%)	Share of urban area allocated to open public space (%)	Share of urban area allocated to streets (%)	Share of urban area allocated to streets & open public space (%)	Proportion of population living within convenient walking distance to open public space (%)
India	Coimbatore	62.8	0.4	11.2	11.6	18.8
India	Hindupur	26.1	0.4	9.0	9.5	24.2
India	Hyderabad	72.0	1.5	19.4	20.9	40.2
India	Jaipur	47.9	4.4	16.8	21.2	18.5
India	Jalna	14.6	0.7	7.0	7.7	20.1
India	Kanchipuram	10.5	0.5	14.9	15.5	34.3
India	Kanpur	16.1	2.6	6.2	8.8	19.2
India	Kolkata	54.3	0.9	8.6	9.5	27.7
India	Malegaon	48.2	1.3	7.0	8.4	25.0
India	Morena	15.5	0.9	7.5	8.4	39.8
India	Mumbai	80.9	1.8	11.3	13.0	35.3
India	Nellore	19.7	0.8	19.7	20.6	35.3
India	Pali	10.1	0.6	5.5	6.0	23.3
India	Parbhani	24.8	0.5	5.2	5.7	10.2
India	Patna	15.3	1.6	10.1	11.8	36.8
India	Pune	75.1	2.2	12.1	14.3	30.8
India	Singrauli	24.3	4.9	8.3	13.1	28.0
India	Sitapur	18.5	4.4	5.3	9.7	28.6
India	Surat	56.8	1.0	9.5	10.4	45.0
India	Thoothukkudi	9.9	0.6	8.4	9.0	24.2
India	Tumkur	12.4	1.4	19.1	20.5	60.4
India	Vijayawada	70.6	4.2	17.1	21.3	45.7
Indonesia	Banda Aceh	29.7	1.6	3.6	5.2	23.9
Indonesia	Bengkulu	48.3	1.7	4.0	5.7	30.2
Indonesia	Kendari	27.2	1.6	3.5	5.1	23.1
Indonesia	Parepare	7.3	3.1	5.9	9.0	50.2
Indonesia	Pematangsiantar	8.0	2.2	4.4	6.6	39.8
Indonesia	Semarang	33.4	1.7	4.3	5.9	39.4
Indonesia	Surabaya	30.6	0.7	4.6	5.3	21.2
Iran (Islamic Republic of)	Ahvaz	11.7	3.1	12.0	15.1	52.3
Iran (Islamic Republic of)	Aradabil	54.1	4.1	18.2	22.3	79.4
Iran (Islamic Republic of)	Arak	66.2	5.6	16.8	22.3	67.7
Iran (Islamic Republic of)	Babol	42.4	0.7	9.2	9.8	28.4
Iran (Islamic Republic of)	Bandar Abbas	36.3	2.5	20.0	22.4	59.5
Iran (Islamic Republic of)	Bojnurd	55.7	2.4	15.9	18.3	45.2
Iran (Islamic Republic of)	Dehdasht	62.2	1.7	15.2	16.9	64.8
Iran (Islamic Republic of)	Esfahan	43.2	1.8	17.0	18.8	50.8
Iran (Islamic Republic of)	Gorgan	12.8	1.9	12.3	14.2	49.2
Iran (Islamic Republic of)	Karaj	14.1	1.9	11.3	13.2	50.6
Iran (Islamic Republic of)	Kashan	22.5	2.9	13.3	16.2	51.4
Iran (Islamic Republic of)	Kashmar	19.5	2.3	13.5	15.8	73.3
Iran (Islamic Republic of)	Kerman	18.1	2.0	15.3	17.4	61.9
Iran (Islamic Republic of)	Khoram Abad	11.6	4.1	15.7	19.8	68.4
Iran (Islamic Republic of)	Mashhad	55.2	4.3	14.1	18.4	54.7
Iran (Islamic Republic of)	Nishabur	32.2	2.2	14.5	16.8	64.7
Iran (Islamic Republic of)	Piranshahr	38.1	1.4	11.8	13.2	52.5
Iran (Islamic Republic of)	Qom	22.6	2.3	15.3	17.5	47.5
Iran (Islamic Republic of)	Salmas	50.8	1.8	12.9	14.7	51.9
Iran (Islamic Republic of)	Sanandaj	53.1	3.9	13.5	17.5	54.8
Iran (Islamic Republic of)	Sari	38.9	0.8	11.8	12.6	31.2
Iran (Islamic Republic of)	Shadegan	40.0	0.9	10.6	11.5	53.9
Iran (Islamic Republic of)	Shahin Shahr	15.4	4.5	15.7	20.3	83.9
Iran (Islamic Republic of)	Shiraz	45.4	2.8	15.6	18.4	54.7
Iran (Islamic Republic of)	Tabriz	59.0	3.4	16.0	19.4	56.3
Iran (Islamic Republic of)	Tehran	53.3	4.6	15.5	20.1	61.1
Iran (Islamic Republic of)	Varamin	20.9	2.1	10.8	12.9	64.3
Iraq	Baghdad	8.1	1.3	13.4	14.7	20.3
Israel	Tel Aviv	84.8	4.3	12.6	16.9	75.8
Italy	Milan	77.7	4.0	9.0	13.0	76.2
Italy	Palermo**	93.9	1.7	8.6	10.2	42.2
Jamaica	Kingston	53.8	1.8	9.5	11.3	24.0
Jamaica	Montego Bay	46.4	2.6	10.6	13.2	63.7
Jamaica	Portmore	12.0	2.3	8.5	10.8	23.8
Japan	Fukuoka	95.4	6.1	20.7	26.8	70.1
Japan	Okayama	25.0	8.3	14.9	23.2	64.0
Japan	Osaka	69.4	4.7	23.0	27.7	72.2
Japan	Tokyo	74.0	3.5	19.7	23.1	74.8
Japan	Yamaguchi	20.2	4.6	13.4	18.0	35.9
Jordan	Amman	10.0	1.3	18.0	19.3	33.9
Jordan	Irbid	4.6	0.6	22.0	22.6	55.0
Kazakhstan	Aktobe	40.5	3.0	13.7	16.6	44.8
Kazakhstan	Almaty	39.1	2.3	13.3	15.6	28.1
Kazakhstan	Aqtay	12.7	1.1	13.9	15.0	7.6
Kazakhstan	Astana (Nur-Sultan)	53.7	4.4	15.1	19.5	26.2
Kazakhstan	Balqash	24.4	2.6	10.7	13.3	44.8
Kazakhstan	Oral	54.0	2.4	13.4	15.8	33.3
Kazakhstan	Oskemen	39.0	2.3	12.9	15.1	29.5
Kazakhstan	Pavlodar	42.8	3.5	12.2	15.7	38.9
Kazakhstan	Qaragandy	53.6	3.8	14.4	18.2	35.4
Kazakhstan	Qaskelen	17.0	1.4	11.1	12.5	20.3
Kazakhstan	Qulsary	20.5	1.8	11.5	13.3	36.4
Kazakhstan	Rudny	53.0	1.4	16.3	17.7	29.1
Kazakhstan	Semey	31.2	1.5	10.7	12.2	19.8
Kazakhstan	Shymkent	22.2	1.0	12.3	13.3	7.4
Kazakhstan	Taldyqorgan	20.5	1.8	12.0	13.8	22.0
Kazakhstan	Taraz	24.1	1.2	13.6	14.8	11.0
Kazakhstan	Temirtay	49.3	2.4	12.3	14.7	53.2
Kazakhstan	Turkistan	27.2	0.7	14.1	14.8	16.6
Kenya	Eldoret	15.2	0.5	11.2	11.7	10.8
Kenya	Kisumu	27.6	0.4	10.0	10.4	11.2
Kenya	Malaba	52.0	2.6	4.9	7.6	25.2
Kenya	Meru	18.9	0.4	6.8	7.2	8.7
Kenya	Nairobi	58.0	1.0	11.1	12.1	17.9
Kenya	Nakuru	12.9	0.5	6.1	6.5	14.9
Kenya	Nyeri	23.9	0.6	8.2	8.8	21.6
Kuwait	Kuwait	39.0	1.5	22.5	24.1	49.4
Kyrgyzstan	Balykchy	63.7	2.3	11.7	14.0	74.7
Kyrgyzstan	Biškek	55.2	3.8	14.8	18.6	59.5
Kyrgyzstan	Jalal-Abad	21.5	1.2	10.0	11.2	33.9

Table C.1:Continued

Country	Cities	Access to Convenient Transport	Access to Open Space			
		Proportion of population living within convenient walking distance to public transport (%)	Share of urban area allocated to open public space (%)	Share of urban area allocated to streets (%)	Share of urban area allocated to streets & open public space (%)	Proportion of population living within convenient walking distance to open public space (%)
Kyrgyzstan	Kara-Balta	21.8	1.9	7.9	9.8	36.3
Kyrgyzstan	Karakol	49.2	2.7	11.6	14.3	49.6
Kyrgyzstan	Kyzyl-Kyja	53.8	2.7	8.9	11.6	62.0
Kyrgyzstan	Naryn	93.4	5.5	13.0	18.5	89.1
Kyrgyzstan	Osh	39.6	1.9	11.4	13.3	46.3
Kyrgyzstan	Talas	69.6	2.9	10.4	13.3	71.2
Kyrgyzstan	Tokmok	59.2	6.3	11.8	18.2	66.7
Kyrgyzstan	Uzgen	59.4	2.7	11.4	14.1	96.1
Lebanon	Baalbek	8.2	1.0	12.8	13.8	45.1
Lebanon	Beirut	20.0	0.8	14.7	15.5	20.7
Lebanon	Sidon	24.4	0.9	12.8	13.6	61.2
Lebanon	Tripoli	30.9	1.4	11.5	12.9	72.8
Lebanon	Tyre	10.6	1.5	9.9	11.4	45.9
Lebanon	Zahle	49.0	0.7	12.1	12.7	36.6
Lithuania	Kaunas**	87.8	6.4	15.4	21.8	61.4
Madagascar	Amparafaravola	70.9	1.5	5.7	7.2	57.5
Madagascar	Antananarivo	53.6	0.8	6.6	7.4	20.5
Madagascar	Antsirabe	65.9	1.4	7.9	9.3	30.1
Madagascar	Antsiranana	48.3	1.1	14.9	16.0	30.2
Madagascar	Fianarantsoa	52.8	2.4	7.2	9.6	57.0
Madagascar	Mahajanga	46.5	1.3	7.7	9.0	18.1
Madagascar	Marovoay	69.9	3.8	7.7	11.5	46.1
Madagascar	Taolanaro	74.1	3.0	7.9	11.0	68.6
Madagascar	Toamasina	31.1	1.9	8.5	10.4	31.9
Madagascar	Toliara	54.8	0.7	7.8	8.4	38.9
Malawi	Blantyre	15.4	2.1	9.1	11.2	22.6
Malawi	Mzuzu	21.4	1.0	11.8	12.8	23.3
Malaysia	Ipoh	38.1	1.8	8.8	10.5	51.1
Malaysia	Rawang	41.1	1.7	10.6	12.3	22.4
Maldives	Male	98.8	6.4	13.2	19.6	97.7
Mali	Bamako	76.6	1.4	10.3	11.7	76.7
Mali	Kayes	57.4	5.6	9.8	15.4	94.2
Mexico	Acapulco (Acapulco de Juárez)	7.4	1.8	8.7	10.5	56.5
Mexico	Apatzingán (Apatzingán de la Constitución)	5.8	2.0	13.6	15.6	53.8
Mexico	Campeche (San Francisco de Campeche)	16.1	2.3	13.3	15.6	81.2
Mexico	Ciudad Juárez (Juárez)	8.9	2.2	12.7	14.9	54.8
Mexico	Ciudad Rio Bravo	9.3	3.9	13.2	17.1	81.9
Mexico	Comitán de Domínguez	10.7	1.3	6.5	7.8	71.4
Mexico	Culiacan	8.6	3.6	13.8	17.4	72.5
Mexico	Ensenada	5.5	1.1	12.3	13.4	42.9
Mexico	Guadalajara	21.5	2.3	13.3	15.6	50.5
Mexico	Guanajuato	43.9	1.3	12.3	13.6	45.7
Mexico	Irapuato	57.7	2.8	11.6	14.4	85.0
Mexico	León (León de los Aldama)	86.8	2.0	14.4	16.4	56.2
Mexico	Mexico City	40.4	3.7	12.7	16.4	46.3
Mexico	Monterrey	10.7	4.4	15.7	20.1	72.6
Mexico	Puebla (Heróica Puebla de Zaragoza)	61.3	1.8	12.0	13.8	33.2
Mexico	Puerto Vallarta	94.8	1.6	11.4	13.0	46.5
Mexico	Reynosa	12.4	1.3	10.4	11.7	27.8
Mexico	San Juan del Río	9.7	2.1	11.9	14.0	71.8
Mexico	Tehuacán	13.6	1.7	11.8	13.5	64.3
Mexico	Tepic	12.3	2.8	16.1	18.8	55.4
Mexico	Tijuana	10.9	1.5	23.1	24.6	51.9
Mexico	Veracruz	7.4	2.4	14.1	16.4	52.5
Mexico	Villahermosa	59.7	2.8	10.6	13.4	89.6
Mexico	Xalapa-Enríquez (Jalapa)	26.6	5.7	13.1	18.8	60.3
Mongolia	Ulaanbaatar	47.3	0.8	8.5	9.2	15.1
Morocco	Agadir	85.4	3.4	12.7	16.1	84.1
Morocco	Azrou	32.3	6.9	16.4	23.4	69.9
Morocco	Casablanca	66.5	1.2	17.9	19.1	29.2
Morocco	Fes	39.1	1.4	17.9	19.3	32.5
Morocco	Fkih Ben Salah	52.1	1.6	16.9	18.6	55.9
Morocco	Maknes	31.6	2.0	19.0	20.9	29.4
Morocco	Marrakesh	74.8	1.6	13.2	14.9	61.3
Morocco	Midelt	64.4	1.2	14.0	15.3	54.4
Morocco	Oujda	15.3	1.3	23.8	25.0	45.5
Morocco	Oulad Teima	35.7	1.4	9.4	10.9	34.8
Morocco	Safi	62.1	4.7	17.6	22.3	55.2
Morocco	Sefrou	30.0	3.4	15.3	18.7	63.6
Morocco	Sidi slimane	37.0	0.5	10.5	11.0	37.4
Morocco	Tanger	70.8	2.0	16.6	18.6	46.9
Morocco	Temara	34.6	2.6	13.8	16.4	25.6
Mozambique	Alto Molocue	53.7	1.0	4.2	5.2	23.7
Mozambique	Beira	7.9	1.0	6.4	7.4	28.0
Mozambique	Gurue	31.6	0.6	6.0	6.6	31.6
Mozambique	Manhica	49.5	0.3	12.9	13.2	10.1
Mozambique	Maputo	52.2	0.8	15.0	15.8	15.3
Mozambique	Maxixe	35.7	0.4	10.6	11.1	25.5
Mozambique	Mocuba	41.1	0.1	9.1	9.3	10.8
Mozambique	Nacala Porto	26.3	0.2	6.2	6.5	13.8
Mozambique	Nampula	10.4	0.2	9.9	10.1	9.3
Mozambique	Pemba	46.0	2.1	14.0	16.1	49.9
Myanmar	Lashio	19.5	0.2	6.3	6.5	13.6
Myanmar	Mandalay	52.4	0.4	9.5	9.9	12.7
Myanmar	Mawlamyine	66.6	1.2	10.5	11.7	37.2
Myanmar	Myede	31.5	1.1	4.7	5.8	45.4
Myanmar	Myeik	61.6	0.5	9.2	9.7	30.7
Myanmar	Myitkyina	10.5	0.7	4.9	5.6	22.7
Myanmar	Naypyitaw	37.4	1.3	8.2	9.5	42.5
Myanmar	Pathein	19.1	0.4	6.2	6.5	16.8
Myanmar	Tachileik	27.5	1.2	8.1	9.3	24.1
Myanmar	Taunggyi	66.2	2.4	5.8	8.3	29.9
Myanmar	Yangon	70.5	1.0	11.2	12.2	16.2
Nepal	Bharatpur	45.8	1.3	5.6	6.9	21.4
Nepal	Biratnagar	9.9	0.7	6.8	7.6	23.2
Nepal	Birendranagar	13.9	1.7	6.7	8.4	29.7
Nepal	Birgunj	13.5	0.9	5.8	6.7	16.7
Nepal	Butwal	16.1	1.7	7.5	9.2	11.9
Nepal	Damak	18.2	0.4	7.0	7.4	11.0
Nepal	Dharan	18.8	1.7	8.3	10.0	33.5
Nepal	Itahari	23.8	1.5	6.0	7.5	17.8
Nepal	Janakpur	10.3	0.9	6.5	7.4	23.9
Nepal	Kathmandu	56.4	2.8	7.2	10.1	45.1
Nepal	Pokhara	75.8	4.7	9.1	13.7	74.5
Netherlands	Zwolle	93.0	7.4	15.0	22.4	91.9
New Zealand	Auckland	94.4	9.2	16.2	25.4	88.4
New Zealand	Christchurch	90.3	8.7	17.7	26.4	83.4
New Zealand	Dunedin	94.4	5.2	15.1	20.3	76.8
New Zealand	Hamilton	96.5	7.7	16.4	24.1	86.4

Table C.1:Continued

		Access to Convenient Transport	Access to Open Space			
Country	Cities	Proportion of population living within convenient walking distance to public transport (%)	Share of urban area allocated to open public space (%)	Share of urban area allocated to streets (%)	Share of urban area allocated to streets & open public space (%)	Proportion of population living within convenient walking distance to open public space (%)
New Zealand	Lower Hutt	97.1	4.8	16.2	21.0	78.1
New Zealand	Napier	89.4	8.6	20.3	28.8	90.3
New Zealand	Palmerston	95.6	7.6	13.7	21.3	87.1
New Zealand	Tauranga	91.7	8.0	15.1	23.2	83.9
New Zealand	Wellington	97.7	9.1	19.2	28.3	82.5
Nicaragua	Chinandega	32.6	1.3	9.5	10.8	34.2
Nicaragua	Ciudad Sandino	60.2	0.5	9.3	9.8	23.0
Nicaragua	Granada	40.7	4.4	9.9	14.3	68.6
Nicaragua	Leon	64.8	2.5	11.4	13.9	52.2
Nicaragua	Managua	70.6	1.7	11.7	13.4	46.8
Nicaragua	Masaya	37.5	1.8	9.4	11.2	69.5
Nicaragua	Tipitapa	38.9	2.9	8.8	11.7	48.5
Niger	Agadez	17.2	1.2	17.0	18.2	45.8
Niger	Dosso	9.0	1.2	15.1	16.3	33.0
Niger	Maradi	16.3	2.9	19.1	22.0	32.0
Niger	Niamey	12.5	0.6	19.4	20.1	26.1
Niger	Zinder	31.0	0.8	19.2	20.1	13.8
Nigeria	Gombe	7.5	0.6	16.4	17.0	20.6
Nigeria	Ibadan	11.8	0.4	13.5	13.8	8.9
Nigeria	Lagos	38.1	0.5	13.8	14.3	6.9
Nigeria	Oyo	20.7	0.8	13.0	13.8	13.5
Northern Mariana Islands	Garapan	7.8	1.6	9.8	11.3	35.6
Oman	Al-Buraymi	10.0	0.4	11.8	12.2	13.2
Oman	Muscat	30.8	0.7	18.2	19.0	13.2
Oman	Salalah	18.0	0.9	16.8	17.6	20.3
Oman	Sohar	52.9	1.0	13.9	14.9	18.2
Pakistan	Attock	7.8	0.4	6.3	6.7	12.0
Pakistan	Bhakkar	11.8	1.3	9.5	10.8	17.6
Pakistan	Chishtian	17.6	1.2	11.0	12.2	23.2
Pakistan	Daska	11.1	0.8	6.1	6.9	16.4
Pakistan	Faisalabad	24.9	1.3	13.0	14.3	34.1
Pakistan	Gujranwala	5.6	1.1	8.6	9.8	18.3
Pakistan	Hafizabad	19.6	0.9	5.7	6.5	19.7
Pakistan	Hyderabad	72.0	1.5	19.4	20.9	43.4
Pakistan	Islamadad	19.7	3.5	9.9	13.4	31.3
Pakistan	Karachi	67.6	3.1	15.5	18.6	45.4
Pakistan	Kohat	7.1	1.3	5.1	6.3	10.3
Pakistan	Lahore	31.2	2.9	16.8	19.6	47.3
Pakistan	Larkana	19.9	0.8	10.0	10.9	23.5
Pakistan	Layyah	11.5	1.3	8.8	10.2	37.1
Pakistan	Mardan	13.3	1.6	6.9	8.6	23.7
Pakistan	Mingawara	11.9	1.5	4.7	6.2	34.3
Pakistan	Multan	32.2	1.4	7.3	8.7	25.7
Pakistan	Nawabshah	23.0	0.8	4.8	5.6	23.8
Pakistan	Peshawar	6.2	1.0	5.7	6.8	11.5
Pakistan	Quetta	8.5	1.5	6.9	8.4	12.8
Pakistan	Sargodha	12.9	1.7	8.3	10.0	28.5
Pakistan	Sheikhupura	5.5	1.0	11.5	12.5	31.9
Pakistan	Shikarpur	24.1	2.6	4.7	7.3	27.8
Pakistan	Sialkot	9.9	0.4	10.5	10.9	14.8
Pakistan	Turbat	8.2	1.0	6.8	7.7	34.2
Panama	Arraijan	25.4	0.5	6.9	7.4	26.3
Panama	Ciudad de Panama	59.8	2.7	10.4	13.1	38.7
Panama	La Chorrera	11.3	0.6	7.4	8.0	29.3
Papua New Guinea	Lae	18.3	1.2	4.6	5.9	13.5
Papua New Guinea	Port Moresby	13.9	1.3	9.4	10.7	40.8
Papua New Guinea	Wewak	30.3	1.0	7.0	8.0	20.3
Paraguay	Asuncion	18.8	1.3	14.1	15.4	32.6
Paraguay	Ciudad del Este	5.0	2.2	15.0	17.3	34.9
Peru	Arequipa	25.7	2.3	14.2	16.5	80.1
Peru	Ayacucho	26.3	3.0	13.9	16.9	74.4
Peru	Cajamarca	29.3	1.3	11.4	12.6	44.6
Peru	Chiclayo	17.9	2.3	15.2	17.5	73.4
Peru	Cusco	55.7	2.4	13.6	16.1	58.9
Peru	Huacho	15.3	1.1	8.8	9.8	53.8
Peru	Huancayo	13.5	0.7	10.9	11.6	30.4
Peru	Huaral	9.3	1.3	13.4	14.7	61.4
Peru	Iquitos	15.5	1.3	8.9	10.2	49.6
Peru	Jaén	26.4	0.4	12.1	12.5	41.5
Peru	Juliaca	14.1	1.6	14.5	16.0	39.2
Peru	Lima	34.2	4.0	14.6	18.6	80.7
Peru	Moquegua	19.3	2.4	14.9	17.3	91.4
Peru	Piura	8.4	1.5	12.9	14.4	50.3
Peru	Trujillo	16.2	1.7	12.7	14.4	53.5
Philippines	Bacolod	13.9	2.9	15.5	8.7	31.2
Philippines	Cebu City	48.1	0.7	14.4	15.1	17.7
Philippines	Manila	32.5	1.6	20.7	22.2	28.7
Poland	Katowice	93.4	3.7	22.5	26.2	70.8
Poland	Lodz**	93.8	4.2	17.1	21.3	49.4
Poland	Lomza**	97.0	3.0	18.4	21.5	67.1
Poland	Lublin**	87.2	2.9	19.1	22.0	49.1
Poland	Mielec	51.7	2.5	10.4	12.9	52.3
Poland	Poznan**	92.9	7.6	15.0	22.6	61.6
Poland	Warsaw**	93.5	6.0	14.6	20.5	64.8
Poland	Wroclaw**	94.6	4.9	17.4	22.3	56.0
Qatar	Doha	100.0	2.9	21.8	24.7	35.5
Qatar	Mesaieed	16.8	0.3	11.4	11.7	26.6
Republic of Korea	Busan	89.6	5.5	14.8	20.3	48.7
Republic of Korea	Cheonan	35.5	2.3	10.6	12.9	31.2
Republic of Korea	Gwangju	87.5	7.1	15.6	22.7	65.4
Republic of Korea	Jinju	64.8	3.4	7.6	11.0	38.4
Republic of Korea	Seoul	70.6	3.0	12.7	15.7	48.8
Romania	ARad	82.4	3.1	11.0	14.1	51.5
Romania	Bucharest**	85.6	3.5	9.5	13.0	54.1
Romania	CampiaTurzii	83.8	2.5	6.0	8.4	50.2
Romania	Craiova**	84.8	4.7	8.1	12.8	60.6
Romania	Falticeni	30.2	1.5	5.2	6.7	44.5
Romania	Mangalia	45.6	3.1	10.3	13.4	66.8
Romania	Navodari	78.7	1.3	7.7	9.0	19.6
Romania	Reghin	60.4	4.6	6.1	10.7	48.8
Romania	Targu Jiu	38.5	1.8	6.3	8.2	36.3
Russian Federation	Astrakhan	73.9	1.2	9.6	10.9	37.1
Russian Federation	Berezniki	65.7	9.4	13.7	23.2	73.7
Russian Federation	Dzerzhinsk	69.8	4.4	12.0	16.4	60.8
Russian Federation	Moscow	85.9	8.3	16.2	24.6	83.3

Table C.1:Continued

Country	Cities	Access to Convenient Transport	Access to Open Space			
		Proportion of population living within convenient walking distance to public transport (%)	Share of urban area allocated to open public space (%)	Share of urban area allocated to streets (%)	Share of urban area allocated to streets & open public space (%)	Proportion of population living within convenient walking distance to open public space (%)
Russian Federation	Saint Petersburg	90.2	3.2	21.8	25.0	40.9
Russian Federation	Tyumen	81.7	5.1	18.3	23.3	64.2
Rwanda	Butare	28.9	0.2	12.1	12.3	6.4
Rwanda	Cyangugu	33.1	0.0	10.0	10.1	4.8
Rwanda	Gisenyi	12.8	1.1	15.8	16.9	12.2
Rwanda	Gitarama	28.9	1.0	10.2	11.2	21.8
Rwanda	Kayonza	26.9	0.4	11.1	11.6	21.6
Rwanda	Kigali	65.2	1.6	11.7	13.3	48.9
Rwanda	Nyanza	24.2	0.5	8.7	9.3	35.3
Rwanda	Ruhengeri	20.0	0.1	10.1	10.2	9.5
Samoa	Apia	18.8	0.7	6.7	7.4	17.2
Saudi Arabia	Al-Khafji	7.5	0.9	11.4	12.3	14.3
Saudi Arabia	Al-Madinah	4.4	1.5	15.2	16.6	17.6
Saudi Arabia	Arar	6.6	2.3	12.3	14.6	20.7
Saudi Arabia	Ar-Rass	20.1	3.2	15.9	19.1	47.6
Saudi Arabia	Makkah	5.5	0.8	16.8	17.6	22.4
Saudi Arabia	Rafha	50.8	2.8	16.3	19.1	53.8
Saudi Arabia	Riyadh	8.6	2.4	13.9	16.3	10.3
Saudi Arabia	Tabuk	16.1	0.7	17.1	17.7	13.4
Saudi Arabia	Taif	12.9	1.3	10.5	11.8	23.6
Senegal	Dakar	77.3	3.1	13.0	16.1	92.5
Senegal	Diourbel	32.3	0.9	21.1	22.0	32.0
Senegal	Kaolack	20.7	1.3	21.3	22.6	44.1
Senegal	Louga	38.7	3.1	18.5	21.6	45.8
Senegal	Mbour	38.9	1.9	22.1	24.0	66.9
Senegal	Saint-Louis	8.9	1.5	23.7	25.1	61.0
Senegal	Thies	35.5	1.1	20.0	21.1	55.7
Senegal	Touba	60.8	1.0	12.2	13.3	43.6
Senegal	Ziguinchor	22.4	1.2	16.6	17.8	44.4
Serbia	Belgrade	90.3	23.4	12.5	35.9	63.8
Serbia	Kikinda	36.8	3.0	5.7	8.7	17.7
Serbia	Kragujevac	33.6	5.7	8.5	14.2	45.0
Serbia	Nis**	85.0	3.7	10.2	13.9	57.2
Serbia	Novi Pazar	19.6	3.0	9.4	12.5	73.2
Serbia	Novi Sad**	76.3	4.4	10.7	15.2	52.9
Serbia	Pozarevac	37.0	3.8	8.9	12.6	37.6
Serbia	Zrenjanin	32.5	2.6	5.6	8.2	48.3
Singapore	Singapore	94.2	7.5	19.4	26.9	70.3
Solomon Islands	Honiara	7.1	0.6	6.5	7.1	19.0
South Africa	Johannesburg	20.8	1.9	10.8	12.7	15.4
South Africa	Port Elizabeth	5.6	3.4	9.3	12.7	29.1
Spain	Madrid**	98.4	6.7	17.2	23.9	63.1
Sri Lanka	Anuradhapura	48.5	2.3	9.5	11.8	51.4
Sri Lanka	Badulla	41.4	2.5	8.7	11.2	58.2
Sri Lanka	Batticaloa	26.6	1.7	10.8	12.5	55.7
Sri Lanka	Chilaw, Ferry Street	24.2	2.8	5.0	7.8	57.6
Sri Lanka	Colombo	62.6	0.5	9.7	10.2	15.2
Sri Lanka	Embilipitiya	25.1	0.9	5.4	6.3	34.7
Sri Lanka	Galle	70.5	2.1	11.2	13.2	38.4
Sri Lanka	Hambantota	42.8	1.9	6.4	8.3	47.6
Sri Lanka	Haputale	53.6	1.7	10.7	12.4	33.9
Sri Lanka	Jaffna	27.4	0.3	6.2	6.4	17.2
Sri Lanka	Kandy	65.7	1.4	12.4	13.7	39.9
Sri Lanka	Matara	53.7	1.2	9.4	10.6	37.3
Sri Lanka	Puttalam	34.7	0.8	8.6	9.4	60.1
Sri Lanka	Ratnapura	59.6	5.2	10.1	15.3	55.7
State of Palestine	Al-Khalil	18.0	0.2	10.7	10.9	13.2
State of Palestine	Al-Quds	52.8	5.0	12.3	17.3	40.0
State of Palestine	An-Nusayrat	18.7	0.6	12.8	13.4	23.6
State of Palestine	Ghazzah	7.7	0.3	13.2	13.4	21.9
State of Palestine	Jenin	21.1	1.1	13.4	14.5	4.9
State of Palestine	Khan Yunis	29.0	0.2	13.0	13.2	33.4
State of Palestine	Nabulus(Nablus)	15.2	0.9	11.4	12.4	21.6
State of Palestine	Rafah	23.8	0.4	13.7	14.1	30.5
Sudan	Al Qadarif	18.8	2.4	21.1	23.5	67.2
Sudan	Atbara	10.1	0.4	20.9	21.3	32.1
Sudan	Bur Sudan	4.5	1.3	21.6	22.9	44.2
Sudan	Kassala	6.9	0.8	22.7	23.4	30.7
Sudan	Khartoum	18.4	0.9	23.2	24.1	14.8
Sudan	Sannar	5.5	1.0	20.3	21.3	32.8
Sudan	Sinjah	5.6	1.5	15.0	16.6	61.2
Sudan	Wad Madani	10.5	1.7	21.3	23.0	47.9
Switzerland	Basel**	95.4	4.5	16.9	21.4	81.8
Switzerland	Bern**	94.3	6.2	19.6	25.8	77.1
Switzerland	Emmen_Lucerne	93.5	8.0	15.8	23.8	87.8
Switzerland	Fribourg**	92.5	7.7	15.7	23.4	80.3
Switzerland	Lausanne**	96.3	5.1	18.5	23.6	76.9
Switzerland	Neuchatel	89.1	3.0	17.3	20.3	70.1
Switzerland	St. Gallen**	97.2	6.6	16.3	22.9	82.9
Switzerland	Wetzikon	97.1	3.0	16.4	19.4	85.4
Switzerland	Winterthur**	93.7	4.7	20.0	24.7	81.9
Switzerland	Zurich**	96.2	3.6	18.3	22.0	67.6
Tajikistan	Chkalovsk (Buston)	46.0	7.2	9.1	16.3	86.8
Tajikistan	Dušanbe [Dushanbe]	40.7	2.2	9.2	11.4	38.7
Tajikistan	Isfara	48.0	2.0	7.6	9.6	54.8
Tajikistan	Istaravshan	27.0	1.6	5.9	7.5	40.4
Tajikistan	Khorog	71.5	4.8	10.6	15.4	83.4
Tajikistan	Khujand	43.9	2.9	9.3	12.2	56.5
Tajikistan	Konibodom	49.6	0.9	11.3	12.3	51.4
Tajikistan	Kulob	39.1	2.7	5.5	8.2	42.7
Tajikistan	ūrġonteppa (Bochtar, Kurgan-T'ube) [Qurghonteppa]	30.4	2.4	7.2	9.6	60.8
Tajikistan	Nurak [Hopak]	41.5	1.6	4.5	6.0	51.6
Tajikistan	Pancakent [Panjakent]	35.0	1.8	5.1	6.9	41.0
Tajikistan	Tursunzoda	36.5	1.6	5.8	7.4	30.5
Tajikistan	Vahdat	23.9	0.9	6.3	7.3	38.9
Thailand	Bangkok	26.0	0.7	14.2	14.9	11.8
Thailand	Cha-Am	13.9	4.2	8.4	12.7	48.0
Thailand	Chiang Mai	33.9	1.4	13.4	14.8	37.0
Thailand	Chiang Rai	14.5	1.3	11.4	12.6	22.3
Thailand	Chumphon	37.8	0.5	9.5	10.0	16.4
Thailand	Khon Kaen	27.2	1.9	14.5	16.4	22.2
Thailand	Phatthalung	37.1	2.1	12.8	15.0	30.0

Table C.1:Continued

		Access to Convenient Transport	Access to Open Space			
Country	Cities	Proportion of population living within convenient walking distance to public transport (%)	Share of urban area allocated to open public space (%)	Share of urban area allocated to streets (%)	Share of urban area allocated to streets & open public space (%)	Proportion of population living within convenient walking distance to open public space (%)
Togo	Lome	38.4	0.7	10.8	11.4	36.5
Tunisia	Al-Qayrawan	33.7	1.9	24.1	26.0	66.7
Tunisia	Banzart	16.1	1.5	15.6	17.1	41.0
Tunisia	Monastir	35.3	2.5	21.6	24.1	71.8
Tunisia	Qabis	30.2	3.1	22.4	25.5	63.1
Tunisia	Safaqis (Sfax)	17.2	0.5	18.8	19.3	35.2
Tunisia	Susah	45.6	1.3	19.4	20.7	53.8
Tunisia	Tozeur	43.5	15.0	21.9	36.9	91.0
Tunisia	Tunis	48.5	2.9	22.2	25.1	45.3
Turkey	Adapazari	23.3	1.8	20.0	21.9	41.8
Turkey	Adiyaman	60.1	2.9	22.0	25.0	84.6
Turkey	Agri	45.0	1.6	15.1	16.7	70.6
Turkey	Ankara	34.0	5.1	21.1	26.2	76.8
Turkey	Antalya	70.8	3.7	16.3	20.0	69.8
Turkey	Balikesir	85.6	2.7	29.0	31.7	90.3
Turkey	Bursa	77.8	2.9	27.0	29.9	70.7
Turkey	Carasamba	63.9	3.0	15.0	18.0	77.3
Turkey	Çerkezköy	47.8	1.2	18.3	19.5	69.2
Turkey	Corum	54.7	2.6	18.9	21.5	80.3
Turkey	Denizli	68.3	3.8	25.1	28.9	76.7
Turkey	Elbistan	33.6	1.3	9.2	10.6	60.6
Turkey	Gaziantep	60.6	6.0	27.5	33.5	83.1
Turkey	Istanbul	91.1	3.1	23.8	26.9	59.8
Turkey	Izmir	83.3	3.8	25.8	29.7	68.9
Turkey	Kayseri	41.4	2.0	17.8	19.9	66.7
Turkey	Konya	44.7	3.0	19.2	22.2	65.3
Turkey	Malatya	59.2	1.0	15.2	16.2	58.8
Turkey	Nigde	57.8	1.4	15.1	16.5	71.5
Turkey	Samsun	42.0	2.7	22.7	25.4	71.2
Turkey	Sanliurfa	53.4	4.0	24.4	28.5	83.8
Turkey	Sivas	75.0	1.8	21.2	23.0	72.0
Turkey	Tarsus	65.6	2.2	22.6	24.8	70.3
Turkey	Uzunköprü	88.5	1.5	21.2	22.6	67.2
Turkey	Viransehir	30.0	3.2	20.0	23.2	84.1
Turkmenistan	Asgabat	60.7	4.3	14.9	19.2	48.8
Turkmenistan	Balkanabat	49.2	2.5	14.5	17.0	70.6
Turkmenistan	Baýramaly (Bajram-Ali)	8.2	0.6	8.9	9.6	12.1
Turkmenistan	Dasoguz	9.1	0.9	8.0	9.0	20.9
Turkmenistan	Mary	26.9	1.3	13.3	14.5	27.8
Turkmenistan	Serdar (Gyzylarbat, Kizyl-Arvat)	8.3	1.2	10.4	11.6	36.9
Turkmenistan	Tejen (Tedžen)	9.2	1.6	15.1	16.7	52.2
Turkmenistan	Turkmenabat	24.5	2.1	13.5	15.6	38.4
Turkmenistan	Turkmenbasy	11.7	1.5	12.8	14.3	49.7
Uganda	Gulu	14.7	4.6	11.1	15.8	76.0
Uganda	Jinja	11.5	0.3	8.8	9.1	17.3
Uganda	Kampala	48.7	0.8	7.4	8.1	22.9
Uganda	Kasese	21.5	0.8	14.6	15.4	20.8
Uganda	Lira	11.2	1.5	11.5	13.0	33.8
Uganda	Masaka	8.4	1.0	9.0	10.0	17.8
Uganda	Mbale	11.6	2.6	6.8	9.4	28.9
Uganda	Mbarara	16.6	1.1	8.6	9.8	18.9
Ukraine	Lviv	94.3	7.0	15.1	22.1	87.0
Ukraine	Nikolaev	79.5	2.4	13.2	15.6	48.0
Ukraine	Rovno	75.9	2.6	13.1	15.7	55.5
United Arab Emirates	Abu Dhabi	27.3	2.7	19.5	22.2	37.6
United Arab Emirates	Al Ain	9.8	1.8	15.8	17.6	41.3
United Arab Emirates	Dubai	41.2	2.7	20.5	23.1	40.6
United Kingdom of Great Britain and Northern Ireland	London**	94.8	12.9	11.9	24.9	81.3
United Kingdom of Great Britain and Northern Ireland	Manchester	98.4	9.0	13.2	22.2	81.6
United Kingdom of Great Britain and Northern Ireland	Sheffield	98.2	5.3	11.8	17.1	58.2
United Republic of Tanzania	Arusha	21.7	0.9	6.1	6.9	16.7
United States of America	Chicago	39.1	6.1	9.8	15.9	47.8
United States of America	Clovis	63.0	2.2	14.1	16.4	31.3
United States of America	Gainesville, FL	73.7	5.3	13.0	18.4	43.1
United States of America	Killeen, TX	28.0	1.8	6.7	8.5	19.4
United States of America	Manchester	98.4	9.0	13.2	22.2	48.3
United States of America	Minneapolis	59.8	6.1	11.8	18.0	54.8
United States of America	Modesto	60.6	2.2	9.8	11.9	41.4
United States of America	Montgomery	35.3	2.8	9.8	12.6	25.7
United States of America	New York	69.8	9.1	9.8	18.9	71.0
United States of America	Philadelphia	59.2	2.9	10.0	12.9	37.3
United States of America	Portland, OR	68.3	4.4	13.4	17.8	57.4
United States of America	Raleigh	33.4	2.4	9.6	12.0	25.4
United States of America	Springfield, MA	55.0	2.9	7.4	10.3	36.8
United States of America	Tallahasee	62.5	2.8	15.2	18.0	35.5
United States of America	Toledo	98.4	2.2	9.3	11.5	27.5
United States of America	Visalia	60.5	3.0	12.3	15.4	65.5
United States of America	Waco	38.5	3.8	11.7	15.5	48.4
Uruguay	Las Piedras	87.5	0.7	13.6	14.3	49.8
Uruguay	Maldonaldo	92.9	1.5	17.1	18.6	81.2
Uruguay	Melo	35.0	0.9	15.5	16.4	69.2
Uruguay	Mercedes	62.5	1.0	15.6	16.6	71.2
Uruguay	Montevideo	76.0	3.8	14.5	18.3	82.7
Uruguay	Paysandu	26.8	2.2	13.8	16.0	70.4
Uruguay	Rivera	23.0	0.4	14.1	14.5	58.9
Uruguay	Salto	45.9	1.2	15.7	16.9	68.0
Uruguay	Tacuarembo	51.7	1.0	12.7	13.7	69.8
Uzbekistan	Andijan	11.6	1.3	10.9	12.3	27.2
Uzbekistan	Bekobod	15.1	3.2	8.1	11.3	62.7
Uzbekistan	Besharyk	38.3	2.4	7.1	9.5	60.2
Uzbekistan	Bukhara	8.2	1.3	7.1	8.4	38.9
Uzbekistan	Kokand	18.8	1.4	6.4	7.8	24.6

Table C.1:Continued

Country	Cities	Access to Convenient Transport	Access to Open Space			
		Proportion of population living within convenient walking distance to public transport (%)	Share of urban area allocated to open public space (%)	Share of urban area allocated to streets (%)	Share of urban area allocated to streets & open public space (%)	Proportion of population living within convenient walking distance to open public space (%)
Uzbekistan	Namangan	27.1	2.8	5.9	8.7	16.5
Uzbekistan	Navoi	19.9	1.5	9.0	10.4	12.2
Uzbekistan	Nukus	41.9	1.1	16.0	17.1	13.3
Uzbekistan	Qarshi	10.0	1.4	12.8	14.2	15.9
Uzbekistan	Tashkent	23.1	1.0	11.0	12.0	5.6
Uzbekistan	Termiz	21.9	0.8	8.6	9.4	10.4
Uzbekistan	To'rtko'l (Turtkul)	9.1	1.1	8.1	9.3	23.1
Uzbekistan	Urganch	10.0	3.1	13.4	16.5	24.9
Venezuela (Bolivarian Republic of)	Acarigua	39.7	3.2	13.5	16.7	56.7
Venezuela (Bolivarian Republic of)	Altagracia de Orituco	26.3	3.3	5.1	8.4	46.7
Venezuela (Bolivarian Republic of)	Barcelona	99.7	5.6	9.7	15.3	59.2
Venezuela (Bolivarian Republic of)	Barinas	34.7	2.3	14.6	16.9	43.6
Venezuela (Bolivarian Republic of)	Barquisimeto	46.7	4.9	12.8	17.7	57.8
Venezuela (Bolivarian Republic of)	Cabimas	33.1	3.5	15.7	19.2	86.0
Venezuela (Bolivarian Republic of)	Cabudare	54.7	6.5	13.6	20.1	79.5
Venezuela (Bolivarian Republic of)	Caracas	44.4	5.0	13.5	18.5	38.1
Venezuela (Bolivarian Republic of)	Ciudad Bolívar	35.7	6.1	11.7	17.8	62.2
Venezuela (Bolivarian Republic of)	Ciudad Guayana (Guayana City)	45.1	2.9	13.8	16.7	56.3
Venezuela (Bolivarian Republic of)	Ciudad Ojeda	20.3	3.4	9.3	12.6	15.6
Venezuela (Bolivarian Republic of)	Coro	37.3	5.6	13.4	19.0	78.6
Venezuela (Bolivarian Republic of)	Cua	33.1	3.2	5.7	8.8	39.6
Venezuela (Bolivarian Republic of)	Cumaná	41.8	2.6	12.6	15.1	59.2
Venezuela (Bolivarian Republic of)	Guarenas & Guatire	24.8	2.1	8.6	10.7	40.4
Venezuela (Bolivarian Republic of)	Los Teques	26.1	2.5	8.2	10.7	36.3
Venezuela (Bolivarian Republic of)	Maracaibo	19.3	1.9	14.4	16.3	35.5
Venezuela (Bolivarian Republic of)	Maracay	22.0	2.3	12.5	14.7	39.7
Venezuela (Bolivarian Republic of)	Mariara	44.0	2.6	12.2	14.8	56.5
Venezuela (Bolivarian Republic of)	SaCarlos Del Zulia	36.7	2.9	8.0	10.8	53.3
Venezuela (Bolivarian Republic of)	San Cristobal	46.7	3.6	12.1	15.7	57.5
Venezuela (Bolivarian Republic of)	San Juan de los Morros	48.8	2.0	8.9	10.9	41.4
Venezuela (Bolivarian Republic of)	Tucupita	48.2	6.6	9.3	15.8	74.3
Venezuela (Bolivarian Republic of)	Valencia	88.0	1.7	12.1	13.8	29.1
Venezuela (Bolivarian Republic of)	Valera	34.8	1.7	9.8	11.5	48.0
Venezuela (Bolivarian Republic of)	Yaritagua	68.1	5.3	11.6	16.9	76.3
Viet Nam	Ho Chi Minh City	68.7	0.8	13.9	14.6	30.4
Yemen	Adan	24.5	1.9	22.9	24.9	51.7
Yemen	Al Hudaydah	30.3	0.6	20.7	21.2	39.4
Yemen	Amran	22.7	0.8	16.0	16.8	27.7
Yemen	Dhamar	35.4	0.8	10.4	11.2	36.2
Yemen	Rada'a	55.0	0.2	11.7	12.0	26.5
Yemen	Sana'a	15.2	0.4	5.9	6.3	12.4
Yemen	Taizz	40.3	0.3	14.8	15.0	9.0
Yemen	Tarim	44.6	3.5	23.0	26.5	26.3
Yemen	Yarim	59.0	1.1	9.9	11.0	13.8
Zambia	Ndola	9.4	0.3	11.1	11.4	8.0

Notes

Access to transport

Indicator is computed as share of population who live within a walking distance (along a street network) of 500 m to a low capacity public transport system (eg bus, tram) and 1000 m to high capacity public transport systems (trains, ferries, etc)

- *Only public transport stops which are mapped are included in the analysis and can include both formal and informal stops where available. Many cities have an informal network which is not fully mapped and may thus record higher levels of access to public transport than reported here*
- *Only public transport modes are considered, which do not include taxisData on public transport stops is sourced from city maps, OSM, GTFS, UITP, Google, and point mapping in some cities. Estimates by DG REGIO are based on data from OSM, TomTom, NSIs, Eurostat, Copernicus Urban Atlas*
- *Data used to estimate population with access to public transport is based on grid level population disaggregation directly from city/country data, HRSL (Facebook and CIESIN), WorldPop or GHS-Pop.*
- *City/urban area used in the analysis has been generated using a classification approach based on the Urban Extent or the Degree of Urbanization concepts to city definition.*

Access to Open Space

- *Indicator is computed as share of urban land in streets and open public space, as well as share of population who can access/live within a walking distance (along a street network) of 400 m to an open public space.*
- *An open public space is defined as openly and freely accessible space for all (without any cost implication). Identification of open public spaces are based on data compiled from city land use plans as well as data available from open sources such as OSM and Google.*
- *Data used to estimate population with access to open public spaces is based on grid level population disaggregation directly from city/country data, HRSL (facebook and CIESIN) or WorldPop. Analysis year is 2019, which in some cases includes population data for 2018.*
- *City/urban area used in the analysis has been generated using a classification approach based on the Urban Extent or the Degree of Urbanization concepts to city definition.*
- *The urban/city area used for the indicator computation may be larger or smaller than the official municipality boundaries.*

Source: United Nations Human Settlement Programme (UN-Habitat), Global Urban Indicators Database 2020

*** Data from European Commission DG REGIO*

a) Includes Az-zarqa, Ar-Rusayfah, Al-Quwaysimah,Tila al-Ali, Wadi as-sir, Al-Jubayhah, Khraibat as-suq and Sahab
b) Includes awallī, Al-Farwānīyah, Al-Fin ās, Al-Jahrā', Janūb al-Kuwayt, Al-Manqaf, Al-Firdaws and Mubārāk al-Kabīr
c) Includes Mohammedia town
d) Includes Bawashar, Matrah and Aseed (Assib)
e) Includes Jabaiyah, Bayt Lāhīyā
f) Includes Dayr al Balah
g) Includes At-Tadamun and Sukrah
h) Includes Ajman and Ash Shariqa

Table C.2: Annual mean levels of fine particulate matter, Urban (micrograms per cubic meter), by Country and Region, 2011-2016

Region/Country	2011	2012	2013	2014	2015	2016
World	**30.2**	**30.9**	**31.8**	**31.9**	**31.4**	**31.2**
Australia and New Zealand	**7.3**	**7.6**	**7.4**	**7.3**	**7.2**	**7.2**
Central and Southern Asia	**58.4**	**63.5**	**65.7**	**72.1**	**67.6**	**68.3**
Eastern and South-Eastern Asia	**36.9**	**39.1**	**41.4**	**41.2**	**37.6**	**35.9**
Europe and Northern America	**12.9**	**11.9**	**11.6**	**11.0**	**11.0**	**10.2**
Latin America and the Caribbean	**19.0**	**18.2**	**17.7**	**17.5**	**16.5**	**16.2**
Northern Africa and Western Asia	**39.8**	**41.1**	**42.3**	**41.9**	**44.6**	**43.5**
Oceania (exc. Australia and New Zealand)	**9.1**	**9.4**	**9.4**	**9.6**	**9.7**	**9.9**
Sub-Saharan Africa	**37.2**	**36.4**	**37.0**	**35.8**	**40.1**	**39.3**
Afghanistan	58.1	63.3	63.0	68.2	63.4	63.6
Albania	24.5	22.4	21.4	21.2	20.5	19.3
Algeria	29.0	29.7	30.3	33.1	33.5	34.1
Andorra	13.2	11.9	11.5	10.1	10.7	9.5
Angola	36.7	35.0	40.8	37.4	39.2	40.3
Antigua and Barbuda	20.5	20.4	20.4	20.8	21.1	21.1
Azerbaijan	23.7	24.4	22.9	21.7	22.4	23.2
Argentina	11.4	11.2	12.1	11.8	12.2	12.4
Australia	7.4	7.8	7.5	7.4	7.3	7.3
Austria	16.9	15.2	14.9	13.6	14.3	12.9
Bahamas	17.4	17.4	17.8	17.8	17.6	17.7
Bahrain	59.0	62.6	66.5	57.7	65.9	63.3
Bangladesh	55.3	61.7	62.4	69.8	65.5	64.1
Armenia	47.2	49.5	45.9	43.0	44.1	45.5
Barbados	25.2	25.0	24.9	25.0	25.9	25.4
Belgium	16.4	14.8	14.2	12.9	13.8	12.8
Bhutan	31.8	34.9	36.5	39.4	36.6	36.9
Bolivia (Plurinational State of)	26.2	27.6	27.8	28.8	27.0	27.3
Bosnia and Herzegovina	39.2	35.5	33.8	33.8	32.7	30.7
Botswana	23.3	23.8	22.9	22.3	28.4	25.1
Brazil	14.9	14.2	13.4	13.3	11.9	11.8
Belize	20.7	20.3	20.8	20.0	20.5	20.7
Solomon Islands	11.4	11.9	11.5	11.4	11.6	11.8
Brunei Darussalam	7.0	7.8	7.3	7.2	7.3	7.4
Bulgaria	27.3	24.8	23.1	24.1	22.3	21.1
Myanmar	30.7	33.5	35.7	32.9	31.1	33.7
Burundi	34.9	36.5	37.4	35.9	36.3	37.3
Belarus	21.8	21.2	21.4	21.5	20.2	18.1
Cambodia	25.1	28.3	28.4	26.0	25.8	27.2
Cameroon	56.5	58.0	57.3	55.7	66.8	64.3
Canada	8.5	8.5	8.0	7.9	7.7	6.7
Cabo Verde	60.7	64.2	60.6	60.0	72.5	62.1
Central African Republic	40.9	41.3	42.1	39.6	43.9	42.9
Sri Lanka	21.3	22.4	22.6	20.7	19.9	16.8
Chad	57.6	62.1	59.3	54.8	70.7	66.8
Chile	24.8	24.1	25.9	25.1	26.6	26.3
China	51.7	53.5	58.6	56.3	54.1	48.8
Colombia	21.0	20.1	20.3	19.9	19.3	19.0
Comoros	14.7	14.7	14.7	14.8	16.3	15.5
Congo	43.1	42.8	46.0	46.1	43.8	44.4
Democratic Republic of the Congo	42.2	43.0	44.5	43.5	43.0	43.3
Costa Rica	20.6	19.4	19.6	19.2	18.8	18.6
Croatia	21.9	19.6	19.4	18.8	18.9	17.7
Cuba	22.5	23.0	22.9	22.8	23.0	22.7
Cyprus	19.7	18.7	17.8	17.1	17.9	15.6
Czechia	19.8	18.2	17.8	17.9	16.9	15.8
Benin	36.4	34.2	35.9	33.0	39.3	38.8
Denmark	13.3	11.4	11.0	11.0	10.9	10.1
Dominica	20.9	20.7	20.7	20.7	21.7	21.6
Dominican Republic	16.6	16.5	16.5	16.6	16.8	16.5
Ecuador	18.4	20.2	19.1	19.7	19.5	19.7
El Salvador	33.5	31.0	32.2	29.8	29.6	29.3
Equatorial Guinea	40.3	39.1	38.2	39.6	45.1	45.0
Ethiopia	29.3	29.7	28.9	28.7	31.5	31.1
Eritrea	33.4	33.3	35.0	31.2	35.3	35.4
Estonia	8.2	7.9	8.0	8.6	7.2	6.7
Fiji	11.1	11.2	11.1	11.1	11.1	11.1

Region/Country	2011	2012	2013	2014	2015	2016
Finland	8.4	7.5	7.0	7.0	6.7	6.5
France	16.2	14.6	14.3	12.6	13.3	12.2
Djibouti	33.4	33.5	33.8	32.8	39.2	38.2
Gabon	37.4	36.4	37.3	39.7	39.7	41.5
Georgia	27.6	28.8	27.0	25.3	26.1	26.9
Gambia	54.4	55.2	54.4	57.2	63.4	58.4
Germany	15.3	13.7	13.3	12.4	12.9	11.8
Ghana	50.2	47.6	49.5	43.9	55.3	55.6
Kiribati	11.1	11.3	11.2	11.2	11.1	11.6
Greece	19.9	18.0	16.8	16.3	16.7	15.0
Grenada	22.7	22.6	22.8	23.1	23.8	23.1
Guatemala	35.2	32.8	34.2	31.7	31.2	30.9
Guinea	50.7	48.2	46.6	45.2	56.6	53.8
Guyana	25.0	25.8	26.5	25.9	26.4	26.8
Haiti	19.5	19.2	19.4	19.5	19.8	19.5
Honduras	29.7	27.5	28.5	26.0	25.7	25.4
Hungary	20.6	18.2	17.9	17.7	17.7	16.7
Iceland	7.7	6.9	6.8	6.3	6.3	5.8
India	65.1	70.2	74.2	81.1	75.9	78.2
Indonesia	16.4	18.2	18.2	17.1	17.8	20.7
Iran (Islamic Republic of)	34.1	34.3	33.9	34.3	34.5	33.7
Iraq	62.3	60.4	60.7	50.3	60.1	56.4
Ireland	11.1	10.0	9.9	9.0	9.1	8.5
Israel	23.5	22.0	21.5	20.1	20.5	18.6
Italy	20.2	18.1	17.4	16.3	17.1	15.3
Côte d'Ivoire	53.9	48.8	50.8	44.9	58.8	58.5
Jamaica	15.0	15.4	15.2	15.3	15.4	15.4
Japan	12.9	13.1	13.6	13.8	13.4	13.7
Kazakhstan	25.8	26.6	25.3	24.1	24.2	25.6
Jordan	33.1	32.5	35.0	33.7	34.0	32.8
Kenya	23.3	24.4	23.9	24.9	22.5	24.1
Democratic People's Republic of Korea	40.0	42.4	46.2	44.4	44.3	39.7
Republic of Korea	24.5	25.0	26.8	26.7	26.4	26.5
Kuwait	65.9	65.4	70.1	56.9	67.4	65.0
Kyrgyzstan	28.7	29.7	28.0	27.0	26.9	28.2
Lao People's Democratic Republic	19.5	21.9	22.9	21.1	19.6	21.8
Lebanon	30.0	30.3	31.8	31.7	32.3	30.7
Lesotho	24.2	23.5	25.3	28.5	30.2	25.8
Latvia	17.2	16.8	17.0	17.9	15.4	14.4
Liberia	46.7	45.0	43.2	38.1	54.9	52.0
Libya	38.9	37.6	45.1	43.6	40.5	46.4
Lithuania	14.0	13.7	13.8	14.2	12.8	11.7
Luxembourg	13.3	11.9	11.7	10.5	11.1	10.2
Madagascar	16.0	15.4	17.7	16.5	19.1	17.9
Malawi	25.6	27.5	24.7	25.2	26.2	24.6
Malaysia	15.0	17.1	16.1	15.3	16.5	17.2
Maldives	10.8	11.5	11.2	10.3	10.0	10.4
Mali	61.2	58.8	53.5	56.3	66.6	63.1
Malta	17.2	15.6	15.3	14.0	14.7	13.1
Mauritania	72.4	73.7	72.9	77.3	80.7	78.1
Mauritius	8.8	9.4	9.8	9.6	9.6	9.5
Mexico	25.9	24.1	24.8	23.8	23.1	22.8
Monaco	15.9	14.0	13.6	12.1	12.8	11.5
Mongolia	58.8	61.5	58.3	55.3	55.8	60.0
Republic of Moldova	17.2	16.5	16.4	16.6	15.5	14.1
Montenegro	24.9	22.9	21.5	21.4	20.8	19.4
Morocco	24.1	22.9	26.2	26.1	28.3	28.6
Mozambique	20.6	21.1	21.1	20.2	21.9	19.9
Oman	40.1	41.6	40.9	37.8	44.2	41.3
Namibia	21.4	19.1	20.0	19.3	23.6	20.5
Nauru	7.0	7.1	7.0	7.3	7.7	8.2
Nepal	68.3	74.5	79.8	87.7	82.0	88.0
Netherlands	15.6	13.9	13.2	12.4	13.0	12.0
Vanuatu	11.3	11.4	11.4	11.4	11.0	11.1
New Zealand	6.8	6.9	6.9	6.8	6.6	6.7
Nicaragua	25.4	24.0	24.4	23.0	22.6	22.6

Table C.2:Continued

Region/Country	2011	2012	2013	2014	2015	2016
Niger	82.2	75.8	67.1	65.9	89.6	89.4
Nigeria	45.4	43.7	43.9	43.4	49.3	47.1
Norway	10.2	8.9	8.6	8.3	8.1	7.6
Micronesia (Federated States of)	10.6	10.5	10.8	10.6	10.9	10.8
Palau	7.1	7.5	7.4	7.9	8.6	8.7
Pakistan	54.6	57.3	59.4	64.1	60.1	62.6
Panama	16.0	15.1	15.3	15.1	14.8	14.5
Papua New Guinea	12.0	12.5	12.1	12.1	12.0	12.2
Paraguay	14.8	14.3	13.1	13.2	12.6	12.0
Peru	30.9	32.6	32.0	33.3	32.7	33.3
Philippines	22.7	24.6	24.5	22.8	22.2	23.7
Poland	27.8	25.5	24.1	23.8	23.5	21.9
Portugal	11.1	10.0	10.1	9.0	9.3	8.4
Guinea-Bissau	51.7	48.8	50.0	50.2	60.2	55.0
Timor-Leste	17.5	18.2	17.9	16.1	16.2	17.7
Qatar	77.4	82.7	88.8	73.0	89.0	81.6
Romania	19.5	17.4	16.5	16.7	16.2	15.7
Russian Federation	12.9	12.9	13.2	13.0	11.9	11.2
Rwanda	36.2	38.6	38.3	38.2	38.3	39.4
Saint Kitts and Nevis	8.2	8.6	8.5	8.9	9.3	9.7
Saint Lucia	22.9	22.8	22.7	23.0	23.8	22.9
Saint Vincent and the Grenadines	22.6	22.7	22.7	22.9	23.4	23.1
San Marino	8.6	8.9	8.7	9.1	9.9	10.1
Sao Tome and Principe	35.7	30.4	36.5	35.8	37.0	38.4
Saudi Arabia	62.8	66.8	69.0	58.2	70.9	64.0
Senegal	56.0	57.2	56.5	60.9	65.8	59.8
Serbia	32.4	29.0	27.2	27.8	26.5	25.2
Seychelles	13.9	13.6	12.5	12.1	12.8	13.7
Sierra Leone	51.4	49.0	47.4	45.1	58.5	56.0
Singapore	13.3	15.4	14.3	14.2	17.0	17.2
Slovakia	22.6	20.3	20.0	19.5	19.2	18.3
Viet Nam	22.8	24.5	25.1	23.0	22.5	23.7
Slovenia	20.9	18.6	18.7	18.4	17.9	16.8
Somalia	22.9	22.4	19.6	21.2	26.4	27.7
South Africa	26.8	26.1	26.8	26.9	30.9	29.4

Region/Country	2011	2012	2013	2014	2015	2016
Zimbabwe	23.6	24.6	23.6	24.1	25.5	24.6
Spain	12.5	11.4	11.0	9.9	10.4	9.5
South Sudan	33.4	33.3	32.9	30.4	36.5	34.6
Sudan	39.8	40.4	40.8	35.3	44.4	43.0
Suriname	28.3	29.3	29.4	29.4	30.6	30.2
Eswatini	20.4	19.9	21.1	19.9	23.0	19.8
Sweden	7.6	6.6	6.4	6.8	6.3	6.0
Switzerland	13.9	12.6	12.1	11.2	11.4	10.3
Syrian Arab Republic	34.4	34.8	36.0	36.1	37.0	35.6
Tajikistan	48.6	49.7	46.8	44.7	45.5	46.5
Thailand	28.6	32.0	33.0	30.2	28.4	31.9
Togo	42.5	40.6	41.9	38.1	46.5	46.1
Tonga	10.9	10.9	10.9	10.9	10.7	11.1
Trinidad and Tobago	23.5	23.6	24.1	24.2	24.9	24.4
United Arab Emirates	40.7	41.8	42.8	38.3	46.0	42.2
Tunisia	28.8	27.0	30.4	31.0	30.4	32.5
Turkey	34.1	35.9	35.5	37.1	38.0	36.9
Turkmenistan	34.8	36.0	33.9	32.4	32.3	33.3
Uganda	39.9	42.1	40.5	41.1	43.9	45.7
Ukraine	17.8	17.0	17.2	17.1	16.3	14.9
North Macedonia	44.0	40.0	36.9	38.4	35.7	33.6
Egypt	62.5	65.9	71.8	69.4	75.3	73.0
United Kingdom of Great Britain and Northern Ireland	13.3	12.0	11.8	10.6	10.9	10.5
United Republic of Tanzania	23.2	24.5	23.8	24.2	24.0	24.6
United States of America	9.6	9.2	8.8	8.8	8.5	7.7
Burkina Faso	50.4	48.3	44.4	45.4	56.7	54.2
Uruguay	9.3	9.2	9.9	9.7	9.9	10.0
Uzbekistan	34.6	36.2	34.0	32.1	32.2	33.9
Venezuela (Bolivarian Republic of)	22.6	21.5	21.5	21.1	20.5	20.1
Samoa	10.8	10.8	11.1	11.2	11.2	11.0
Yemen	40.6	43.3	42.7	37.9	44.6	40.3
Zambia	29.0	29.6	29.4	27.8	30.0	29.4

Source: United Nations Statistics Division (UNSD), SDG Indicators Global Database, last update December 2021.

References

Abdelkader, Y., H. Elaydi, A. Mansour and J. Schechla (2020) *A Pandemic of Violations: Forced Evictions and Other Habitat related Human Rights Violations amid COVID 19*, Housing and Land Rights Network, Cairo, http://www.hlrn.org/img/publications/Pandemic_Violations.pdf, last accessed 13 December 2021

Abdullah, H. (ed) (2021) *Towards a European Green Deal with Cities: The Urban Dimension of the EU's Sustainable Growth Strategy*, Confederation of Indigenous Peoples of Bolivia (CIDOB), Barcelona

Åberg, H. E. and S. Tondelli (2021) 'Escape to the country: a reaction-driven rural renaissance on a Swedish island post COVID-19', *Sustainability* **13**(22): 12895

Abergel, T. (2021) *Lighting,* International Energy Agency, Paris https://www.iea.org/reports/lighting, last accessed 8 November 2021

Abreha, K. G., W. Kassa, E. K. K. Lartey, T. A. Mengistae, S. Owusu and A. G. Zeufack (2021) *Industrialization in Sub-Saharan Africa: Seizing Opportunities in Global Value Chains*, Africa Development Forum, World Bank, Washington, DC

Abu, M. and S. N. A. Codjoe (2018) 'Experience and future perceived risk of floods and diarrheal disease in urban poor communities in Accra, Ghana', *International Journal Of Environmental Research and Public Health* **15**(12): 2830

Abudu Kasei, R., M. D. Kalanda-Joshua and D. T. Benefor (2019) 'Rapid urbanisation and implications for indigenous knowledge in early warning on flood risk in African cities', **7**(2): 183-214

ACF International (2020) *Building Urban Resilience: The Moving Urban Poor Communities in the Philippines Toward Resilience (MOVE UP) Model*, Action Against Hunger, United States, https://rilhub.org/wp-content/uploads/2020/05/MOVEUP-Building-Urban-Resilience_compressed.pdf, last assessed 4 May 2022

Acuto, M. (2016) 'Give cities a seat at the top table', *Nature* **537**(7622): 611-613.

Acuto, M. (2020) 'COVID-19: Lessons for an urban(izing) world', *One Earth*, **2**(4): 317-319

Acuto, M., S. Larcom, R. Keil, M. Ghojeh, T. Lindsay, C. Camponesch, and S. Parnell (2020) 'Seeing COVID-19 through an urban lens', *Nature Sustainability*, **3**: 977–978

Adams, E. A. and G. O. Boateng (2018) 'Are urban informal communities capable of co-production? The influence of community–public partnerships on water access in Lilongwe, Malawi', *Environment and Urbanization* **30**(2): 461-480

Adams, E. A., J. Stoler and Y. Adams (2020) 'Water insecurity and urban poverty in the Global South: Implications for health and human biology' *American Journal of Human Biology* **32**(1): e23368

Adepoju, M. and R. Sen (2021) *100% Renewables Cities and Regions Roadmap Framework*, Local Governments For Sustainability and 100% Renewables Cities and Regions Roadmap, Germany, https://renewablesroadmap.iclei.org/resource/100-renewables-cities-and-regions-roadmap-framework/#, last accessed 11 May 2022

Adger, W. N., R. S. de Campos, T. Siddiqui, M. F. Gavonel, L. Szaboova, M. H. Rocky, M. R. A. Bhuiyan and T. Billah (2021) 'Human security of urban migrant populations affected by length of residence and environmental hazards', *Journal of Peace Research* **58**(1): 50-66

Adrian, T. and G. Gopinath (2021) 'Addressing inflation pressures amid an enduring pandemic', *IMFblog*, 3 December, https://blogs.imf.org/2021/12/03/addressing-inflation-pressures-amid-an-enduring-pandemic/, last accessed 6 May 2022

Agbodjinou, S. (2020) 'African smart cities in 2030', *Field Actions Science Reports* **22**: 40-43

Agence France-Presse (2021) ''Dystopian world': Singapore patrol robots stoke fears of surveillance state', *The Guardian*, 6 October, https://www.theguardian.com/world/2021/oct/06/dystopian-world-singapore-patrol-robots-stoke-fears-of-surveillance-state, last accessed 6 November 2021

Aggarwala, R. T. and J. Sirefman (2021) 'Infrastructure options for the future of cities', https://www.mckinsey.com/business-functions/operations/our-insights/infrastructure-options-for-the-future-of-cities, last accessed 8 November 2021

Agyemang, F. S. K, E. E. Silvaa and M. Poku-Boansib (2019) 'Understanding the urban spatial structure of Sub-Saharan African cities using the case of urban development patterns of a Ghanaian city-region', *Habitat International* **85** (March 2019): 21-33

Ahmad, E., D. Dowling, D. Chan, S. Colenbrander and N. Godfrey (2019) *Scaling Up Investment for Sustainable Urban Infrastructure: A Guide to National and Subnational Reform* , Coalition for Urban Transitions, London and Washington, DC

Ahrend, R., C. Gamper and A. Schumann (2014) 'The OECD metropolitan governance survey: A quantitative description of governance structures in large urban agglomerations', OECD Regional Development Working Papers, No. 2014/04, OECD Publishing, Paris

Aichholzer, G., H. Kubicek and L. Torres (2015) *Evaluating E-Participation: Frameworks, Practice, Evidence*, Springer

Ajuntament de Barcelona (2021) *The Digital Divide in the City of Barcelona 2020: Executive Summary*, Cities for Digital Rights, https://citiesfordigitalrights.org/sites/default/files/Executive%20Summary_Digital%20Divide%20Barcelona.2020_0.pdf, last accessed 27 September 2021

Akter, S., Hakim, S. S., and Rahman, M. S. (2021) 'Planning for pandemic resilience: COVID-19 experience from urban slums in Khulna, Bangladesh', *Journal of Urban Management* **10**(4): 325–344

Albert, C., B. Schröter, D. Haase, M. Brillinger, J. Henze, S. Herrmann, S. Gottwald, P. Guerrero, C. Nicolas and B. Matzdorf (2019) 'Addressing societal challenges through nature-based solutions: How can landscape planning and governance research contribute?', *Landscape and Urban Planning* **182**: 12-21

Alberti, M., T. McPhearson and A. Gonzalez (2018) 'Embracing urban complexity', in T. Elmqvist, X. Bai, N. Frantzeskaki, C. Griffith, D. Maddox, T. McPhearson, S. Parnell, P. Romero-Lankao, D. Simon and M. Watkins (eds) *Urban Planet*, Cambridge University Press, Cambridge, pp. 45-67

Alexander, C., S. Berrisford, L. Nkula-Wenz, D. Ndhlovu, G. Siame, V. Watson, and D. Zinnbauer (2022) 'Challenges and opportunities of curbing urban corruption and building professional integrity: Experiences of planners in South Africa and Zambia', *Habitat International* **122** (in press)

Alexandra, J. (2019) 'For green cities to become mainstream we need to learn from local success stories and scale up', *The Conversation*, 8 July, https://theconversation.com/for-green-cities-to-become-mainstream-we-need-to-learn-from-local-success-stories-and-scale-up-119933, last accessed 11 May 2022

Alexandri, G. and M. Janoschka (2020) '"Post-pandemic" transnational gentrifications: a critical outlook', *Urban Studies* **57**(15): 3202–3214

Allan, J. I. and J. Hadden (2017) 'Exploring the framing power of NGOs in global climate politics', *Environmental Politics* **26**(4): 600-620

Allain-Dupre, D. (2017) *Decentralization trends in OECD countries: A comparative perspective for Ukraine,* OECD, https://www.oecd.org/regional/regional-policy/Decentralisation-trends-in-OECD-countries.pdf, last accessed 25 February 2022

Allcott, H., A. Collard-Wexler and S. D. O'Connell (2016) 'How do electricity shortages affect industry? Evidence from India', *American Economic Review* **106**(3): 587-624

Allen, B., L. Tamindael, S. Bickerton and W. Cho (2020) 'Does citizen coproduction lead to better urban services in smart cities projects? An empirical study on e-participation in a mobile big data platform', *Government Information Quarterly* **37**: 101412

Allen, R. and C. S. Slotterback (2021) 'Building immigrant engagement practice in urban planning: the case of Somali refugees in the Twin Cities', *Journal of Urban Affairs* **43**(6): 740-755

Alliance for Affordable Internet (2021) 'The Costs of Exclusion: Economic Consequences of the Digital Gender Gap', Web Foundation, https://a4ai.org/research/costs-of-exclusion-report, last accessed 25 February 2022

Allied Market Research (2018) 'Smart cities market by functional area (smart governance & smart education, smart energy, smart infrastructure, smart mobility, smart healthcare, smart building, and others): Global opportunity analysis and industry forecast, 2018-2025', *Allied Market Research*, https://www.alliedmarketresearch.com/smart-cities-market, last accessed 8 November 2021

Almenar, J. B., T. Elliot, B. Rugani, B. Philippe, T. N. Gutierrez, G. Sonnemann and D. Geneletti (2021) 'Nexus between nature-based solutions, ecosystem services and urban challenges', *Land Use Policy* **100**: 104898

Amiri, S. (2021) 'Toward City Diplomacy 2.0. Centre of Public Diplomacy', CPD Blog, https://uscpublicdiplomacy.org/blog/toward-city-diplomacy-20, last accessed 25 February 2022

Ammann, C. and T. Forster (2018) 'African Cities and the Development Conundrum', International Development Policy Series – 10, Geneva, Boston: Graduate Institute Publications, Brill-Nijhoff, https://library.oapen.org/bitstream/handle/20.500.12657/37967/9789004387942_webready_content_text.pdf?sequence=1#page=74, last accessed 25 February 2022

Amundi Asset Management and International Finance Corporation (2020) *Emerging Market Green Bonds Report 2019: Momentum Builds as Nascent Markets Grow*, International Finance Corporation, https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/climate+business/resources/em-gb-report-2019, last accessed 3 May 2022

Anayi, L., N. Bloom, P. Bunn, P. Mizen, G. Thwaites and I. Yotzov (2022) 'The impact of the war in Ukraine on economic uncertainty', *Voxeu*, https://voxeu.org/article/impact-war-ukraine-economic-uncertainty, last accessed 20 May 2022

Anderson, C., R. McGee, N. J. Nampoothiri and J. Gaventa, with S. Forquilha, Z. Ibeh, V. Ibezim-Ohaeri, A. Jawed, A. Khan, C. Pereira and A. Shankland (2021) *Navigating Civic Space in a Time of Covid: Synthesis Report*, Institute of Development Studies, Brighton, UK

Anderson, J. and D. Nassiry with S. Barnard, M. Lindfield, R. Teipelke and M. Wilder (2019) *Financing the Sustainable Urban Future: Scoping a Green Cities Development Bank*, C40 and the Overseas Development Institute, https://cdn.odi.org/media/documents/12680.pdf, last accessed 11 May 2022

Andrae, A. and T. Edler (2015) 'On global electricity usage of communication technology: trends to 2030', *Challenges* **6**(1): 117-157

Andrijevic, M., C.-F. Schleussner, M. J. Gidden, D. L. McCollum and J. Rogelj (2020) 'COVID-19 recovery funds dwarf clean energy investment needs', *Science* **370**(6514): 298-300

Angel, S. and A. M. Blei (2016) 'The productivity of American cities: How densification, relocation, and greater mobility sustain the productive advantage of larger U.S. metropolitan labor markets', *Cities* **51**: 36-51

Angel, S., and A. Blei (2020) 'Why pandemics, such as COVID-19, require a metropolitan response', *Sustainability* **13**(1): 79

Angel, S., P. Lamson-Hall and Z. G. Blanco (2020) *Anatomy of Density I: Measurable Factors that Together Constitute Urban Density*, Working Paper, https://marroninstitute.nyu.edu/uploads/content/Anatomy_of_Density_I%2C_3_August_2020.pdf, last accessed 6 April 2022

Angel, S., P. Lamson-Hall, A. Blei, S. Shingade and S. Kumar (2021) 'Densify and expand: a global analysis of recent urban growth', *Sustainability* **13**(7): 3835

Anguelovski, I. (2016) 'From toxic sites to parks as (green) LULUs? New challenges of inequity, privilege, gentrification, and exclusion for urban environmental justice', *Journal of Planning Literature* **31**(1): 23-36

Anguelovski, I., J. J. Connolly, H. Pearsall, G. Shokry, M. Checker, J. Maantay, K. Gould, T. Lewis, A. Maroko and J. T. Roberts (2019) 'Opinion: Why green "climate gentrification" threatens poor and vulnerable populations', *Proceedings of the National Academy of Sciences* **116**(52): 26139-26143

Anguelovski, I., J. J. Connolly, M. Garcia-Lamarca, H. Cole and H. Pearsall (2019) 'New scholarly pathways on green gentrification: What does the urban 'green turn' mean and where is it going?', *Progress in Human Geography* **43**(6): 1064-1086

Anguelovski, I., L. Shi, E. Chu, D. Gallagher, K. Goh, Z. Lamb, K. Reeve and H. Teicher (2016) 'Equity impacts of urban land use planning for climate adaptation: critical perspectives from the global North and South', *Journal of Planning Education and Research* **36**(3): 333-348

Anheier, H. K., M. Lang and S. Toepler (2019) 'Civil society in times of change: Shrinking, changing and expanding spaces and the need for new regulatory approaches', *Economics: Open-Assessment E-Journal* **13**(1): 1-27

Anjorin, S. S., A. A. Ayorinde, M. S. Abba, D. Mensah, E. A. Okolie, O. A. Uthman and O.O. Oyebode (2021) 'Equity of national publicly funded health insurance schemes under the universal health coverage agenda: A systematic review of studies conducted in Africa', *Journal of Public Health*, https://doi.org/10.1093/pubmed/fdab316, last accessed 7 June 2022

Annan-Aggrey, E., E. Bandauko, and G. Arku, (2021) 'Localising the sustainable development goals in Africa: Implementation challenges and opportunities' *Commonwealth Journal of Local Governance*, **24**: 4-23

Annez, P., R. Buckley and J. Kalarickal (2010) 'African urbanization as a flight? Some policy implications of geography', *Urban Forum* **21**: 221-234

Anyumba, G. and M. Sirayi (2021) 'Indigenous knowledge and historic city formation in Africa: Learning from the past', in M. Sirayi, M. Kanyane, G. Verdini (eds) *Culture and Rural–Urban Revitalisation in South Africa*, Routledge, London, pp. 72-89

Araos, M., S.E. Austin, L. Berrang-Ford, and J.D. Ford (2015) 'Public health adaptation to climate change in large cities: A global baseline', *International Journal of Health Services* **46**(1): 53-78

Arcadis (2018) *Citizen Centric Cities: The Sustainable Cities Index 2018*, Arcadis, https://www.arcadis.com/campaigns/citizencentriccities/images/%7B1d5ae7e2-a348-4b6e-b1d7-6d94fa7d7567%7Dsustainable_cities_index_2018_arcadis.pdf, last accessed 19 March 2022

Arimah, B. C. (2010) 'The face of urban poverty: Explaining the prevalence of slums in developing countries' in J. Beall, B. Guha-Khasnobis and R. Kanbur (eds) *Urbanization and Development: Multidisciplinary Perspectives*, Oxford University Press, Oxford

Armah, F. A., B. Ekumaha, D. O.Yawsona, J. O. Odoib, A-R, Afitiria, and F. E. Nyiekuc (2018) 'Access to improved water and sanitation in sub-Saharan Africa in a quarter century' *Heliyon*, **4**(11)

Arun, C. (2020) 'AI and the global South: Designing for other worlds', In Dubber, M., F. Pasquale and S. Das (eds) *The Oxford Handbook of Ethics of AI*, Oxford University Press, Oxford

Asaee, S. R., A. Sharafian, O. E. Herrera, P. Blomerus and W. Mérida (2018) 'Housing stock in cold-climate countries: Conversion challenges for net zero emission buildings', *Applied Energy* **217**: 88-100

Atwoli, L.,A. H. BaquiT. Benfield, R. Bosurgi, F. Godlee, S. Hancocks, R. Horton, L. Laybourn-Langton, C. A. Monteiro, I. Norman and K. Patrick (2021) 'Call for emergency action to limit global temperature increases, restore biodiversity, and protect health: Wealthy nations must do much more, much faster', *Nutrition Reviews* **79**(11): 1183-1185

Auethavornpipat, R. and M. Tanyag (2021) *Protests and Pandemics: Civil Society Mobilisation in Thailand and the Philippines during COVID-19: Policy Briefing –SEARBO2*, Australian National University, Australia, https://openresearch-repository.anu.edu.au/bitstream/1885/238577/2/SEARBO-Report-Auethavornpipat-and-Tanyag.pdf, last accessed 23 April 2022

Augsberger, A., M. Collins, W. Gecker, K. Lusk and M. Dougher (2016) 'Youth Lead the Change: Participatory Budgeting', Boston University Initiative on Cities, https://www.bu.edu/ioc/files/2017/01/Youth-Lead-the-Change_Report.pdf, last accessed 8 May 2022

Aurigi, A. and N. Odendaal (2021) 'From "smart in the box" to "smart in the city": Rethinking the socially sustainable smart city in context', *Journal of Urban Technology* **28**(1-2)

Avis, W. R. (2016) *Urban Governance (Topic Guide)*, Birmingham, UK: GSDRC, University of Birmingham, https://gsdrc.org/wp-content/uploads/2016/11/UrbanGov_GSDRC.pdf, last accessed 25 February 2022

Avner, P. and S. V. Lall (2016) *Matchmaking in Nairobi: The Role of Land Use*, Policy Research Working Paper 7904, World Bank, Washington, DC

Avni, N., N. Brenner, D. Miodownik and G. Rosen (2021) 'Limited urban citizenship: The case of community councils in East Jerusalem', *Urban Geography*: 1-21

Azevedo, J. C., S. Luque, C. Dobbs, G. Sanesi, and T. C. H. Sunderland, (2020) 'The ethics of isolation, the spread of pandemics, and landscape ecology', *Landscape Ecology* **35**(10): 2133–2140

Bach, T. (2020) 'The 10 U.S. cities with the largest income inequality gaps', *US News*, 21 September, https://www.usnews.com/news/cities/articles/2020-09-21/us-cities-with-the-biggest-income-inequality-gaps, last accessed 6 June 2022

Bäckstrand, K. and J. W. Kuyper (2017) 'The democratic legitimacy of orchestration: The UNFCCC, non-state actors, and transnational climate governance', *Environmental Politics*: 1-25

Bailey, I. (2007a) 'Climate policy implementation: Geographical perspectives', *Area* **39**(4): 415-417

Bailey, I. (2007b) 'Neoliberalism, climate governance and the scalar politics of EU emissions trading', *Area* **39**(4): 431-442

Baker, J. L. (2008) *Urban Poverty: A Global View*, World Bank Urban Papers, World Bank, Washington, DC, http: //documents1.worldbank.org/curated/en/954511468315832363/pdf/430280NWP0Glob10Box327344B01PUBLIC1.pdf, last accessed 23 April 2022

Bakhtavar, E., T. Prabatha, H. Karunathilake, R. Sadiq and K. Hewage (2020) 'Assessment of renewable energy-based strategies for net-zero energy communities: A planning model using multi-objective goal programming', *Journal of Cleaner Production* **272**: 122886

Bakshi, T. and A. Bhattacharyya (2021) 'Socially distanced or socially connected? Well-being through ICT Usage among the Indian elderly during COVID-19', *Millennial Asia* **12**(2): 190-208

Balling, C. E., S. C. Napolitano, S. P. Lane, and D. B. Samuel (2021) 'The impact of personality and lifestyle change on distress during the COVID-19 pandemic', *Collabra: Psychology* **7**(1): https://doi.org/10.1525/collabra.19525

Bamu, P. and T. Marchiori (2020) 'Recognition and protection of informal traders in COVID-19', WIEGO, December, https://www.wiego.org/resources/recognition-and-protection-informal-traders-covid-19-laws-lessons-africa, last accessed 24 March 2022

Bandauko, E., E. Annan-Aggrey, and G. Arku (2021) 'Planning and managing urbanization in the twenty-first century: Content analysis of selected African countries - national urban policies', *Urban Research and Practice* **14**(1): 94-104

Bandauko, E., G. Arku and H. Nyantakyi-Frimpong (2022) 'A systematic review of gated communities and the challenge of urban transformation in African cities', *Journal of Housing and the Built Environment*, **37**: 339–368

Bandauko, E., S. K. Kutor, and G. Arku (2022) 'To leave or not to leave? An analysis of individual and neighbourhood characteristics shaping place attachment in Harare's selected informal settlements', *The Canadian Geographer*, https://doi.org/10.1111/cag.12743, last accessed 7 June 2022

Bandauko, E., S. K. Kutor, E. Anna-Aggrey and G. Arku (2022) '"They say these are places for criminals, but this is our home": Internalizing and countering discourses of territorial stigmatization in Harare's informal settlements', *International Development Planning Review* **44** (2): 217–239

Bangalore, M., A. Smith, and T. Veldkamp (2019) 'Exposure to floods, climate change, and poverty in Vietnam' *Economics of Disasters and Climate Change*, **3**: 79–99

Bansard, J. S., P. H. Pattberg and O. Widerberg (2017) 'Cities to the rescue? Assessing the performance of transnational municipal networks in global climate governance', *International Environmental Agreements: Politics, Law and Economics* **17**(2): 229-246

Barbarossa, L. (2020) 'The post pandemic city: Challenges and opportunities for a non-motorized urban environment. An overview of Italian cases', *Sustainability* **12**(17): 7172

Barcelona En Comú (2019) *Fearless Cities: A Guide to the Global Municipalist Movement*, New Internationalist, https://fearlesscities.com/sites/default/files/fearless_book_en.pdf, last accessed 7 March 2022

Barkham, R. J., Brown, K., Parpa, C., Breen, C., Carver, S. and Hooton, C. (2013) *Resilient Cities: A Grosvenor Research Report*, Grosvenor Global Outlook, United Kingdom.

Barns, S. (2020) *Platform Urbanism: Negotiating Platform Ecosystems in Connected Cities*, Palgrave Macmillan, Singapore

Barrios, S., L. Bertinelli and E. Strobl (2006) 'Climatic change and rural-urban migration: The case of sub-Saharan Africa', *Journal of Urban Economics* **60**(3): 357-371.

Bartholomae, F. W., C. W. Nam and A. M. Schoenberg (2017) 'Urban shrinkage and resurgence in Germany', *Urban Studies* **54**: 2701–2718

Bartholomew, K. (2007) 'Land use-transportation scenario planning: Promise and reality', *Transportation*, **34**(4): 397-412

Bartlett, S. and C. Tacoli (2021) 'Urban children and malnutrition', in S. Sabry (ed) *Research Series: Cities for Children and Youth,* Global Alliance - Cities 4 Children, Zurich, https://cities4children.org/wordpress/wp-content/uploads/2021/06/Nutrition-and-Food-Security-20210616.pdf, last accessed 24 March 2022

Baruah, B. (2015) 'NGOs as intermediaries for pro-poor urban electrification', in M. Hodson and S. Marvin (eds) *Retrofitting cities: Priorities, Governance and Experimentation*, Earthscan, London and New York, pp. 150-170

Basu, R. and J. Ferreira (2021) 'Planning car-lite neighborhoods: Does bike-sharing reduce auto-dependence?', *Transportation Research Part D, Transport and Environment* **92**: 102721

Bataille, C. G. F. (2020) 'Physical and policy pathways to net€zero emissions industry', *Wiley Interdisciplinary Reviews: Climate Change* **11**(2): e633

Bataille, C., H. Waisman, Y. Briand, J. Svensson, A. Vogt-Schilb, M. Jaramillo, R. Delgado, R. Arguello, L. Clarke and T. Wild (2020) 'Net-zero deep decarbonization pathways in Latin America: Challenges and opportunities', *Energy Strategy Reviews* **30**: 100510

Bates, L., A. Zwick, Z. Spicer, T. Kerzhner, A. Kim, A. Baber, J. Green and D. Moulden (2019) 'Gigs, side hustles, freelance: what work means in the platform economy city/ blight or remedy: understanding ridehailing's role in the precarious "gig economy"/ labour, gender and making rent with Airbnb/ the gentrification of 'sharing': from bandit cab to ride share tech/ the 'sharing economy'? precarious labor in neoliberal cities/ where is economic development in the platform city?/ shared economy: WeWork or we work together', *Planning Theory & Practice* **20**(3): 423-446

Battistoni, P., M. Grimaldi, M. Sebillo and G. Vitiello (2022) 'Living Labs and Open Innovation to Support Local Development Policies', in E. Borgogno-Mondino and P. Zamperlin (eds) *Geomatics and Geospatial Technologies:24th Italian conference, ASITA 2021*, Proceedings, Genoa, Italy, 1-2 July 2021, pp. 339–350

Bauriedl, S. and A. Strüver (2020) 'Platform urbanism: Technocapitalist production of private and public spaces', *Urban Planning* **5**(4): 267–276

Baxter, A. J., E. J. Tweed, S. V. Katikireddiand and H. Thomson (2019) 'Effects of housing first approaches on health and well-being of adults who are homeless or at risk of homelessness: Systematic review and meta-analysis of randomised controlled trials', *Journal of Epidemiology and Community Health* **73**(5): 379-387

Bayulken, B., D. Huisingh and P. M. J. Fisher (2021) 'How are nature-based solutions helping in the greening of cities in the context of crises such as climate change and pandemics? A comprehensive review', *Journal of Cleaner Production* **288**: 125569

Beauvais, E. (2018) 'The Grandview€Woodland Citizens' Assembly: An experiment in municipal planning', *Canadian Public Administration* **61**(3): 341-360

Becchio, C., M. C. Bottero, S. P. Corgnati and F. Dell'Anna (2018) 'Decision making for sustainable urban energy planning: An integrated evaluation framework of alternative solutions for a NZED (Net Zero-Energy District) in Turin', *Land Use Policy* **78**: 803-817.

Beebeejaun, Y. (2017) 'Gender, planning, and epistemic injustice', in M. Bevir, K. McKee and P. Matthews, P (eds) *Decentring Urban Governance: Narratives, Resistance and Contestation*, Routledge, London, United Kingdom, pp. 67-88

Beer, A., V. Akshay, A. Rainnie, W. Veitch and T. Clower (2020) *The Impacts of Specialisation and Diversification on Australia's Mid-Sized Towns*, The Regional Australia Institute, Canberra

BEIS (2021) *Net Zero Strategy: Build Back Greener*, BEIS (Department for Business, Energy and Industrial Strategy), London, https://www.gov.uk/government/publications/net-zero-strategy, last accessed 19 March 2022

BEIS and C. Skidmore (2019) 'UK becomes first major economy to pass net zero emissions law', https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law, last accessed 19 March 2022

Bell, S. L. (2019) 'Experiencing nature with sight impairment: Seeking freedom from ableism', *Environment and Planning E: Nature and Space* **2**(2): 304-322

Bellomo, S. and F. Ferraro (2020) *Modern Forms of Work: A European Comparative Study*, Sapienza Università Editrice, Rome

Benites, H. S. and P. Osmond (2021) 'Bioconnections as enablers of regenerative circularity for the built environment', *Urban Planning* **6**(4): 25-39

Benner, C., E. Johansson, K. Feng and H. Witt (2020) *On-demand and on-the-edge: Ride-ailing and Delivery Workers in San Francisco,* Executive Summary, UC Santa Cruz Institute for Social Transformation, Santa Cruz

Benton, M., J. Batalova, S. Davidoff-Gore and T. Schmidt (2021) 'COVID-19 and the state of global mobility in 2020', Washington, DC, and Geneva: Migration Policy Institute and International Organization for Migration, https://publications.iom.int/books/covid-19-and-state-global-mobility-2020#:~:text=The%20year%202020%20was%20a,international%20students%20to%20family%20reunification, last accessed 25 February 2022

Beretta, I. (2018) 'The social effects of eco-innovations in Italian smart cities', *Cities* **72**: 115-121

Berg, J., M. Furrer, E. Harmon, U. Rani and M. Six Silberman (2018) *Digital labour platforms and the future of work: Towards decent work in the online world*, International Labour Organization (ILO), Geneva

Berggruen Institute (2021) 'Reimagining the role of cities and city diplomacy in the multilateral order: Workshop summary', United Nations Foundation, https://www.berggruen.org/activity/reimagining-the-role-of-cities-city-diplomacy-in-the-multilateral-order-workshop-summary, last accessed 25 February 2022

Berke, P., J. Kates, M. Malecha, J. Masterson, P. Shea and S. Yu (2021) 'Using a resilience scorecard to improve local planning for vulnerability to hazards and climate change: An application in two cities', *Cities* **119**: 103408, https://doi.org/10.1016/j.cities.2021.103408

Bernaciak, A., A. Rzeźca and A. Sobol (2017) 'Participatory budgeting as a tool of environmental improvements in Polish cities', *Economic and Environmental Studies* **17**(4): 893-906

Bernal, V. A. V., M. A. T. Correa and S. A. P. Barón (2020) 'How to finance Colombian cities during the COVID-19 pandemic', *World Bank Blogs*, 21 December, https://blogs.worldbank.org/latinamerica/how-finance-colombian-cities-during-covid-19-pandemic, last accessed 27 February 2022

Beukes, A. (2015) *Making the Invisible Visible: Generating Data on 'Slums' at Local, City and Global Scales*, Working Paper, International Institute for Environment and Development (IIED), London, http: //pubs.iied.org/10757IIED, last accessed 24 March 2022

Beveridge, R., F. Hüesker and M. Naumann (2014) 'From post-politics to a politics of possibility? Unravelling the privatization of the Berlin Water Company', *Geoforum* **51**:66–74

Bezgrebelna, M., K. McKenzie, S. Wells, A. Ravindran, M. Kral, J. Christensen, V. Stergiopoulos, S. Gaetz and S. A. Kidd (2021) 'Climate change, weather, housing precarity, and homelessness: A systematic review of reviews', *International Journal of Environmental Research and Public Health* **18**(11): 5812

Bhaumik, S., S. Moola, J. Tyagi, D. Nambiar and M. Kakoti (2020) 'Community health workers for pandemic response: A rapid evidence synthesis', *BMJ Global Health* **5**(6): e002769

Bhowmick, G. D., D. Dhar, D. Nath, M. M. Ghangrekar, R. Banerjee, S. Das, and J. Chatterjee (2020) 'Coronavirus disease 2019 (COVID-19) outbreak: Some serious consequences with urban and rural water cycle', *Npj Clean Water* **3**(1): 32

Bigger, P. and S. Webber (2021) 'Green structural adjustment in the World Bank's resilient city', *Annals of the American Association of Geographers* **111**(1): 36-51

Biggeri, M. (2021) 'A "Decade for Action" on SDG Localisation', *Journal of Human Development and Capabilities* **22**(4):706-712

Billger, M., L. Thuvander and B. S. Wästberg (2017) 'In search of visualization challenges: The development and implementation of visualization tools for supporting dialogue in urban planning processes', *Environment and Planning B: Urban Analytics and City Science* **44**(6): 1012-1035

Bilsky, E., A. C. Moreno and A. Fernández Tortosa (2021) 'Local Governments and SDG Localisation: Reshaping Multilevel Governance from the Bottom up', *Journal of Human Development and Capabilities*, ***22***(4):713-724

Biswas P.P. (2020) 'Skewed urbanization and the contagion', *Economic and Political Weekly* **55**(16): 13–15

Biswas, N. R. (2009) 'Civil Society Organizations in Global Governance: Reflections on CSOs in Bangladesh', *Society and Change* **4**(3)*:* 7-29

Biswas, A. K., C. Tortajada and M. Stavenhagen (2018) 'Managing shrinking cities in an expanding world', *The Conversation*, 22 February, https://theconversation.com/managing-shrinking-cities-in-an-expanding-world-91448, last accessed 3 May 2022

Blanco, I., Y. Salazar and I. Bianchi (2020) 'Urban governance and political change under a radical left government: The case of Barcelona', *Journal of Urban Affairs* **42**(1): 1–21

Blay-Palmer, A., G. Santini, J. Halliday, R. Malec, J. Carey, L. Keller, J. Ni, M. Taguchi and R. van Veenhuizen (2021) 'City region food systems: Building resilience to COVID-19 and other shocks', *Sustainability* **13**(3): 1325

Bloom, D. E., D. Canning and J. Sevilla (2003) *The Demographic Dividend*, First Edition, United States, RAND Corporation, United States of America, http: //www.jstor.org/stable/10.7249/mr1274wfhf-dlpf-rf-unpf, last accessed 6 April 2022

BloombergNEF (2021) 'Electric vehicle outlook 2021', *BloombergNEF*, 7 July, https://about.bnef.com/electric-vehicle-outlook/, last accessed 8 November 2021

Bocquier, P. and R. Costa (2015) 'Which transition comes first? Urban and demographic transitions in Belgium and Sweden', *Demographic Research* **33**: 1297-1332, https://doi.org/10.4054/DemRes.2015.33.48, last accessed 6 April 2022

Bojovic, D., J. Benavides and A. Soret (2020) 'What we can learn from birdsong: Mainstreaming teleworking in a post-pandemic world', *Earth System Governance* **5**: 100074

Bolay, J.-C. (2020) *Urban Planning Against Poverty: How to Think and Do Better in Cities in the Global South*, Springer

Bonato, D. and R. Orsini (2018) 'Urban circular economy: The new frontier for European cities' sustainable development', in W. W. Clark (ed) *Sustainable Cities and Communities Design Handbook*, Second Edition, Butterworth-Heinemann, London, pp. 235-245, https://doi.org/10.1016/B978-0-12-813964-6.00012-4, last accessed 3 May 2022

Boterman, W. R. (2020) 'Urban€ural polarisation in times of the Corona outbreak? The early demographic and geographic patterns of the SARS€CoV€2 epidemic in the Netherlands', *Tijdschrift Voor Economische En Sociale Geografie* **111**(3): 513–529

Boubacar, S., M. Pelling, A. Barcena and R. Montandon (2017) 'The erosive effects of small disasters on household absorptive capacity in Niamey: A nested HEA approach', *Environment and Urbanization* **29**(1): 33-50

Bowler, D. E., L. Buyung-Ali, T. M. Knight and A. S. Pullin (2010) 'Urban greening to cool towns and cities: A systematic review of the empirical evidence', *Landscape and Urban Planning* **97**(3): 147-155

Boyce, M. and R. Katz (2021) 'COVID-19 and the proliferation of urban networks for health security' *Health Policy and Planning*, **36**(3):357–359

Boylan, A. (2020) 'The future of farming: Hydroponics', Princeton Student Climate Initiative, https://psci.princeton.edu/tips/2020/11/9/the-future-of-farming-hydroponics, last accessed 8 November 2021

Boyle, A. D., G. Leggat, L. Morikawa, Y. Pappas and J. C. Stephens (2021) 'Green new deal proposals: Comparing emerging transformational climate poli-

cies at multiple scales', *Energy Research & Social Science* **81**: 102259
Bradfield, R., G. Wright, G. Burt, G. Cairns and K. Van Der Heijden (2005) 'The origins and evolution of scenario techniques in long range business planning', *Futures* **37**(8): 795-812
Bradshaw, J. R., F. Bennett, C. Glendinning, B. Tunstall and K. E. Bloor (2021) *ESPN Thematic Report on Social Protection and Inclusion Policy Responses to the COVID-19 Crisis United Kingdom*, Research Report, European Union, https://eprints.whiterose.ac.uk/177997/1/ESPN_UK_policy_responses_COVID_crisis_2020_21.pdf, last accessed 11 April 2022
Bredenoord, J., P. Van Lindert and P. Smets (2014) *Affordable Housing in the Urban Global South: Seeking Sustainable Solutions*, Routledge, New York
Brinkerhoff, D. W., A. Wetterberg and E. Wibbels (2018) 'Distance, services, and citizen perceptions of the state in rural Africa', *Governance* **31**(1): 103-124
Brisbois, B, P. O'Campo and J. Kamalanathan (2019) 'Inequities in cities and in urban health', in S. Galea, C. K. Ettman and D. Vlahov (eds) *Urban Health*, Oxford University Press, London and New York
Broom, D (2020) 'This is how we can save millions of people from extreme poverty after COVID-19', https://www.weforum.org/agenda/2020/12/this-is-how-we-can-save-millions-of-people-from-extreme-poverty-after-covid-19/ last accessed 23 April 2022
Broom, D. (2021) 'Flying cars and driverless buses – the future of urban mobility has landed', https://www.weforum.org/agenda/2021/04/low-emission-flying-cars-future-of-cities/, last accessed 19 March 2022
Brückner, M. (2012) 'Economic growth, size of the agricultural sector, and urbanization in Africa', *Journal of Urban Economics* **71**: 26-36
Bruckner, T. (2019) 'The Ignored Pandemic: How Corruption in Healthcare Service Delivery Threatens Universal Health Coverage', Transparency International, http://ti-health.org/wp-content/uploads/2019/03/IgnoredPandemic-WEB-v3.pdf, last accessed 25 February 2022
Bryant, B. and P. Mohai (eds) (2019) *Race and the Incidence of Environmental Hazards: A Time for Discourse*, Routledge, New York
Bulkeley, H. (2019) *Accomplishing Climate Governance*, Cambridge University Press, Cambridge
Buque, L. I. B. and H. Ribeiro (2015) 'Overview of the selective waste collection with pickers in Maputo municipality, Mozambique: Challenges and perspectives', *Saúde e Sociedade* **24**: 298-307
Burch, S. and J. D. DiBella (2021) 'Business models for the Anthropocene: Accelerating sustainability transformations in the private sector', *Sustainability Science* **16**: 1963–1976
Burch, S., S. Hughes, P. Romero-Lankao and H. Schroeder (2018) 'Governing urban sustainability transformations: The new politics of collaboration and contestation,' in T. Elmqvist, X. Bai, N. Frantzeskaki, C. Griffith, D. Maddox, T. McPhearson, S. Parnell, P. Romero-Lankao, D. Simon and M. Watkins (eds) *Urban Planet*, Cambridge University Press, Cambridge, pp. 303-326
Burnett, R., H. Chen, M. Szyszkowicz, N. Fann, B. Hubbell, C. A. Pope, J. S. Apte, M. Brauer, A. Cohen and S. Weichenthal (2018) 'Global estimates of mortality associated with long-term exposure to outdoor fine particulate matter', *Proceedings of the National Academy of Sciences* **115**(38): 9592-9597
Burns, R., V. Fast and A. Levenda (2021) 'Smart cities: Between worlding and provincialising', *Urban Studies* **58**(3): 461-470
Busch, H., L. Bendlin and P. Fenton (2018) 'Shaping local response–The influence of transnational municipal climate networks on urban climate governance', *Urban Climate* **24**: 221-230
Busch, R. (2017) 'Disrupting transportation: We need to think bigger than cars', https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/disrupting-transportation-we-need-to-think-bigger-than-cars, last accessed 19 March 2022
Büscher, B., G. Feola, A. Fischer, R. Fletcher, J.F. Gerber, W. Harcourt, M. Koster, M. Schneider, J. Scholtens, M. Spierenburg and V. Walstra (2021) 'Planning for a world beyond COVID-19: Five pillars for post-neoliberal development', *World Development* **140**: 105357
Business Insider (2021) 'A California city gave some residents $500 per month. After a year, the group wound up with more full-time jobs and less depression', *Business Insider*, 3 March, https://www.businessinsider.com/stockton-basic-income-experiment-success-employment-wellbeing-2021-3?r=US&IR=T, last accessed 25 October 2021
Buttazzoni, A., M. Veenhof and L. Minaker (2020) 'Smart city and high-tech urban interventions targeting human health: An equity-focused systematic review', *International Journal of Environmental Research and Public Health* **17**(7): 2325
Byers, E., M. Gidden, D. Leclère, J. Balkovic, P. Burek, K. Ebi, P. Greve, D. Grey, P. Havlik, A. Hillers, N. Johnson, T. Kahil, V. Krey, S. Langan, N. Nakicenovic, R. Novak, M. Obersteiner, S. Pachauri, A. Palazzo, S. Parkinson, N. D. Rao, J. Rogelj, Y. Satoh, Y. Wada, B. Willaarts, and K. Riahi (2018) Global exposure and vulnerability to multi-sector development and climate change hotspots. *Environmental Research Letters,* **13**(5): 055012.
C40 Cities and Arup (2021) *Green and Thriving Neighbourhoods; A pathway to net zero, featuring the '15-minute city'*, C40 Cities and Arup, London, https://www.c40.org/wp-content/uploads/2021/10/C40-Arup-GTN-Guide-book_2021.pdf
C40 Knowledge Hub (2020) 'How to build back better with a 15-minute city', July, https://www.c40knowledgehub.org/s/article/How-to-build-back-better-with-a-15-minute-city?language=en_US, last accessed 19 March 2022
C40 Knowledge Hub (2021a) '15-minute cities: How to create connected places', C40 Knowledge Hub, https://www.c40knowledgehub.org/s/article/15-minute-cities-How-to-create-connected-places?language=en_US, last accessed 21 March 2022
C40 Knowledge Hub (2021b) '15-minute cities: How to develop people-centered streets and mobility', *C40 Knowledge Hub*, May, https://www.c40knowledgehub.org/s/article/15-minute-cities-How-to-develop-people-centred-streets-and-mobility?language=en_US, last accessed 21 March 2022
Caldeira, T. and J. Holston (2015) 'Participatory urban planning in Brazil', *Urban Studies* **52**(11): 2001-2017
Calisto Friant, M. (2019) 'Deliberating for sustainability: Lessons from the Porto Alegre experiment with participatory budgeting', *International Journal of Urban Sustainable Development* **11**(1): 81-99
Calvo, P. (2020) 'The ethics of Smart City (EoSC): Moral implications of hyperconnectivity, algorithmization and the datafication of urban digital society', *Ethics and Information Technology* **22**: 141–149
Calzada, I. and E. Almirall (2020) 'Data ecosystems for protecting European citizens' digital rights', *Transforming Government: People, Process and Policy* **14**(2): 133-147
Campbell, S. (1996) 'Green cities, growing cities, just cities?: Urban planning and the contradictions of sustainable development', *Journal of the American Planning Association* **62**(3): 296–312
Canadell, P., C. Le Quéré, G. Peters, P. Friedlingstein, R. Andrew and R. Jackson (2021) 'Global emissions almost back to pre-pandemic levels after unprecedented drop in 2020, new analysis shows', *The Conversation*, 4 November, https://theconversation.com/global-emissions-almost-back-to-pre-pandemic-levels-after-unprecedented-drop-in-2020-new-analysis-shows-170866, last accessed 2 May 2022
Capello, R., A. Caragliu and U. Fratesi (2015) 'Spatial heterogeneity in the costs of the economic crisis in Europe: Are cities sources of regional resilience?', *Journal of Economic Geography* **15**(5): 951– 972
Capstick, S., I. Lorenzoni, A. Corner and L. Whitmarsh (2014) 'Prospects for radical emissions reduction through behavior and lifestyle change', *Carbon Management* **5**(4): 429-445
Cardullo, P. and R. Kitchin (2019) 'Being a 'citizen' in the smart city: Up and down the scaffold of smart citizen participation in Dublin, Ireland', *GeoJournal* **84**: 1-13
Cardullo, P., C. di Feliciantonio and R. Kitchin (eds) (2019) *The Right to the Smart City*, Emerald Publishing Limited, Bingley
Carlson, C. J., G. F. Albery, C. Merow, C. H. Trisos, C. M. Zipfel, E. A. Eskew, K. J. Olival, N. Ross and S. Bansal (2022) 'Climate change increases cross-species viral transmission risk', *Nature* **605**(7908): 20
Carrington, D. (2022) 'UK government sued over "pie-in-the-sky" net-zero climate strategy', *The Guardian*, 12 January, https://www.theguardian.com/environment/2022/jan/12/net-zero-climate-strategy-uk-government-sued, last accessed 19 March 2022
Carter, E. D. (2016) 'Environmental justice 2.0: New Latino environmentalism in Los Angeles', *Local Environment* **21**(1): 3-23
Cartwright, A., S. Parnell, G. Oelofse and S. Ward (2012) *Climate Change at the City Scale; Impacts, Mitigation and Adaptation in Cape Town*, Earthscan, Routledge, London
Castán Broto, V. and L. Westman (2020) 'Ten years after Copenhagen: Reimagining climate change governance in urban areas', *Wiley Interdisciplinary Reviews Climate Change* **11**: e643, https://doi.org/10.1002/wcc.643
Castán Broto, V. and L. Westman (2021) *Urban Sustainability and Justice: Just Sustainabilities and Environmental Planning*, Zed Books, Bloomsbury, London
Castán Broto, V. and M. Sanzana Calvet (2020) 'Sacrifice zones and the construction of urban energy landscapes in Concepción, Chile', *Journal of Political Ecology* **27**(1): 279-299
Castán Broto, V., D. A. Macucule, E. Boyd, J. Ensor and C. Allen (2015) 'Building collaborative partnerships for climate change action in Maputo, Mozambique', *Environment and Planning A* **47**(3): 571-587
Castán Broto, V., L. Westman and P. Huang (2021) 'Reparative innovation for urban climate adaptation', *Journal of the British Academy* **9**(Supp 8)
Castán Broto, V., L. Westman and X. Ruiz-Campillo (2022) 'The role of local governments in international climate policy', in *Oxford Research Encyclopedia,* https://oxfordre.com/climatescience/view/10.1093/acrefore/9780190228620.001.0001/acrefore-9780190228620-e-842, last accessed 25 May 2022
Cavada, M., D. V. Hunt, and C. D. Rogers (2016) 'Do Smart Cities Realise their Potential for Lower Carbon Dioxide Emissions?', *Proceedings of the Institution of Civil Engineers-Engineering Sustainability* **169**(6): 243–252
CBC (2020) 'Nearly 2,000 TDSB students still waiting to receive laptops, tablets for virtual learning', https://www.cbc.ca/news/canada/toronto/tdsb-students-devices-for-remote-learning-1.5766694, last accessed 10 June 2022
CDC Evidence Review (2021) *What's the Impact of Investing in Urban Infrastructure in Africa?*, Insight: Impact study 20, CDC Group, https://assets.cdcgroup.com/wp-content/uploads/2021/06/29140858/Whats-the-impact-ofinvesting-in-urban-infrastructure-in-Africa.pdf, last accessed 3 May 2022
Ceder, A. (2021) 'Urban mobility and public transport: Future perspectives and review', *International Journal of Urban Sciences* **25**(4): 455–479
Centraal Bureau van Statistiek (2022) 'Urban data centres', https://www.cbs.nl/en-gb/onze-diensten/urban-data-centres, last accessed 8 May 2022

Cervero, R. (2000) *Informal Transport in the Developing World*, United Nations Commission on Human Settlements, Nairobi

Cervero, R., and A. Golub (2007) 'Informal transport: A global perspective', *Transport Policy* **14**(6): 445-457

César, C. (2021) *Boosting Productivity in Sub-Saharan Africa: Policies and Institutions to Promote Efficiency*, World Bank, Washington, DC, https://doi: 10.1596/978-1-4648-1550-8, last accessed 3 May 2022

Chakraborty, A. (2011) 'Enhancing the role of participatory scenario planning processes: Lessons from reality check exercises', *Futures* **43**(4): 387-399

Chang, C., L. Chiari, Y. Cao, H. Jin, M. Mokhtari and H. Aloulou (eds) (2016) 'Inclusive smart cities and digital health', *14th International Conference on Smart Homes and Health Telematics*, 25-27 May, Wuhan, China

Chant, S. (2013) 'Cities through a "gender lens": A golden "urban age" for women in the global South?', *Environment and urbanization* **25**(1): 9-29

Chanza, N. and A. De Wit (2016) 'Enhancing climate governance through indigenous knowledge: Case in sustainability science', *South African Journal of Science* **112**(3-4): 1-7

Charlton, J. I. (1998) *Nothing About Us Without Us: Disability Oppression and Empowerment,* University of California Press, Berkeley, CA

Chatwin, M. (2022) 'Data innovation among local governments in fragile settings', An unpublished background research paper for the UNDP project: Data Innovation in the Public Sector.

Chavez, A. and A. Ramaswami (2013) 'Articulating a trans-boundary infrastructure supply chain greenhouse gas emission footprint for cities: Mathematical relationships and policy relevance', *Energy Policy* **54**: 376-384

Checulin, D., D. Mohr, V. Pokotilo and J. Woetzel (2021) 'Building a transport system that works: Five insights from our 25-city report', https://www.mckinsey.com/business-functions/operations/our-insights/building-a-transport-system-that-works-five-insights-from-our-25-city-report, last accessed 1 May 2022

Chen, H., L. Wang and W. Chen (2019) 'Modeling on building sector's carbon mitigation in China to achieve the 1.5 C climate target', *Energy Efficiency* **12**(2): 483-496

Chen, M. (2020) 'COVID-19, cities and urban informal workers: India in comparative perspective', *The Indian Journal of Labour Economics* **63:** 41–46.

Chen, M. and F. Carré (2020) 'Introduction', in M. Chen and F. Carré (eds) *The Informal Economy Revisited: Examining the Past, Envisioning the Future*, Taylor & Francis, pp.1-27

Chen, M. and V. Beard (2018) *Including the Excluded: Supporting Informal Workers for More Equal and Productive Cities in the Global South*, Working Paper, World Resources Institute, Washington, DC

Chen, T., E. C. M. Hui, Y. Tu, and W. Lang (2021) 'Growth or shrinkage: Discovering development patterns and planning strategies for cross-border areas in China', *Journal of Urban Planning and Development* **147**(4): 05021046

Chernick, H., D. Copeland, and A. Reschovsky (2020) 'The fiscal effects of the COVID-19 pandemic on cities', *National Tax Journal* **73**(3): 699–732

Chester, M. V., J. Sperling, E. Stokes, B. Allenby, K. Kockelman, C. Kennedy, L. A. Baker, J. Keirstead and C. T. Hendrickson (2014) 'Positioning infrastructure and technologies for low€carbon urbanization', *Earth's Future* **2**(10): 533-547

Chilkoti, A. (2021) 'The World ahead 2022. The number of people in extreme poverty is falling again', *The Economist*, 8 November, https://www.economist.com/the-world-ahead/2021/11/08/the-number-of-people-in-extreme-poverty-is-falling-again?giftId=7ecccec2-2b69-44d3-ac30-3e7666df812d, last accessed 5 May 2022

Cho, S., K. Mossberger, D. Swindell and J. Selby (2021) 'Experimenting with public engagement platforms in local government', *Urban Affairs Review* **57**(3): 763-793

Chu, E. and K. Michael (2019) 'Recognition in urban climate justice: Marginality and exclusion of migrants in Indian cities', *Environment and Urbanization* **31**(1): 139-156

Chu, E., A. Brown, K. Michael, J. Du, S. Lwasa, and A. Mahendra (2019*) Unlocking the Potential for Transformative Climate Adaptation in Cities*, Background Paper, Global Commission on Adaptation and World Resources Institute, Rotterdam, Netherlands and Washington, DC

Churkina, G., A. Organschi, C. P. Reyer, A. Ruff, K. Vinke, Z. Liu, B. K. Reck, T. Graedel and H. J. Schellnhuber (2020) 'Buildings as a global carbon sink', *Nature Sustainability* **3**(4): 269-276

Cilliers, J. (2021) 'Towards green(er) cities: Contextualizing green benefits for urban spaces and contemporary societies', *Urban Planning* **6**(4): 1-3

Cinderby, S., D. Archer, V. K. Mehta, C. Neale, R. Opiyo, R.M. Pateman, C. Muhoza, C. Adeline and H. Tukhanen (2021) 'Assessing inequalities in wellbeing at a neighbourhood scale in low-middle-income-country secondary cities and their implications for long-term livability', *Frontiers in Sociology* **6**: 729453

Cities Alliance (2021a) *Post COVID-19 Sustainable and Regenerative Development of Secondary Cities in Emerging Economies*, Cities Alliance, Brussels, https://www.citiesalliance.org/sites/default/files/2021-03/CA_SecondaryCitiesPostCOVID-19-FinalWeb.pdf, accessed 23 April 2022

Cities Alliance (2021b) *Secondary Cities Post COVID-19: Sustainable and Regenerative Development of Secondary Cities in Emerging Economies*, Cities Alliance and UNOPS, Brussels

Cities Alliance (2021c) *Building Climate Resilient and Sustainable Cities for All*, Cities Alliance, Brussels

Cities Alliance (2022) *The Challenge of Slums—An Overview of Past Approaches to Tackle It'*, The Challenges of Slums, Cities Alliance, Brussels, https://www.citiesalliance.org/sites/default/files/2022-03/Cities%20Alliance_Inforality%20Paper%20Series_The%20Challenges%20of%20Slums.pdf, last accessed 23 April 2022

Cities Coalition for Digital Rights (2021) 'Cities for digital rights: To protect and uphold digital rights at the local and global level', *Cities for Digital Rightsa*, https://citiesfordigitalrights.org/, last accessed 30 October 2021

Cities for Global Health (2022) https://www.citiesforglobalhealth.org, last accessed 16 May 2022

Cities for Public Water (2016) 'Declaration for the Public Management of Water', conference convened by La Red Agua Pública/the Public Water network in collaboration with the Municipal Council of Madrid, November 3-4 2016, https://www.tni.org/en/article/consolidation-of-the-public-water-movementin-spain, last accessed 25 February 2022

Cities Today (2021) 'Does it spark joy? Tampere rethinks smart city KPIs', *Cities Today*, 26 October, https://cities-today.com/does-it-spark-joy-tampere-rethinks-smart-city-kpis/, last accessed 11 May 2022

Cities4Health (2020) *Expanding Cycling Infrastructure to Fight the COVID-19 Pandemic: Lima, Peru,* Cities4Health, New York, https://cities4health.org/assets/library-assets/lima_final_oct-2020.pdf, last accessed 1 May 2022

Citizens' Committee for Children of New York (2019) 'Households without Internet; Community District; Percent; 2019', https://data.cccnewyork.org/data/map/1325/household-internet-access#1325/a/3/1547/62/a/a, last accessed 23 May 2022

City of Bandung (2022) 'Bandung city dashboard', http://data.bandung.go.id/dashboard/, last accessed 23 May 2022

City of Chattanooga Office of Economic Development (2019) 'Why Chattanooga', *City of,* https://econ.chattanooga.gov/why-chattanooga/, last accessed 30 October 2021

City of Gothenburg (2019) *Green Bond Framework*, https://finans.goteborg.se/wpui/wp-content/uploads/2019/09/City-of-Gothenburg-Green-Bond-Framework-2019-09-12-1.pdf, last accessed 11 May 2022

City of Hamilton (2019) 'Coming together to end homelessness: Hamilton's systems planning framework', https://www.homelesshub.ca/resource/coming-together-end-homelessness-hamiltons-systems-planning-framework#:~:text=Working%20from%20a%20rights%2Dbased,of%20Ontario%20and%20Canada%20respectively, last accessed 25 February 2022

City of Kigali (2020) *Kigali Master Plan 2050: Master Plan Report*, https://gis.kigalicity.gov.rw/portal/sharing/rest/content/items/8bf652ea231f4bc5a756461a6d487026/data, last accessed 24 March 2022

City of Kitakyushu and Institute for Global Environmental Strategies (2018) *Kitakyushu City the Sustainable Development Goals Report 2018*, https://www.uncclearn.org/wp-content/uploads/library/kitakyushu_sdgsreport_en_0713.pdf, last accessed 6 April 2022

City of Melbourne (2020) *Economic Impacts of COVID-19 on the City of Melbourne,* https://www.melbourne.vic.gov.au/sitecollectiondocuments/economic-impacts-covid-19-summary.pdf, last accessed 30 April 2022

City of Melbourne (2021) *Annual Report 2020–21*, https://www.melbourne.vic.gov.au/SiteCollectionDocuments/annual-report-2020-21.pdf, last accessed 29 April 2022

City of Melbourne (2022) 'Melbourne as a smart city', https://www.melbourne.vic.gov.au/about-melbourne/melbourne-profile/smart-city/Pages/smart-city.aspx, last accessed 20 May 2022

City of New York and UN-Habitat (2021) 'Leading locally: The origins and impact of Voluntary Local Reviews', Mayor's Office of International Affairs, City of New York, https://www1.nyc.gov/site/international/programs/leading-locally-vlr.page, last accessed 25 February 2022

City of Portland (2021) 'Open data: A key component for 21st century digital services', https://www.portland.gov/what-works-cities/news/2021/5/13/open-data-key-component-21st-century-digital-services, last accessed 20 May 2022

City of Richmond (2022) 'Health in All Policies', https://www.ci.richmond.ca.us/2575/Health-in-All-Policies, last accessed 15 June 2022

City of Seattle (2021) 'Participatory budgeting', Seattle City Council, https://www.seattle.gov/council/issues/past-issues/participatory-budgeting, last accessed 8 May 2022

City of Toronto (2021) 'ConnectTO program aims to increase digital equity and access to affordable high-speed internet in Toronto', https://www.toronto.ca/news/connectto-program-aims-to-increase-digital-equity-and-access-to-affordable-high-speed-internet-in-toronto/, last accessed 24 March 2022

City of Windsor (2020) *Windsor Works – An Economic Development Strategy for the City's Future Growth*, https://www.citywindsor.ca/mayorandcouncil/Documents/Windsor-Works-Report.pdf , last accessed 3 May 2022

Civic Tech Field Guide (2021) 'Qlue My City', https://directory.civictech.guide/listing/qlue-my-city, last accessed 23 May 2022

CIVICUS (2018) 'Democracy for all: Beyond a crisis of imagination', https://www.civicus.org/documents/reports-and-publications/reimagining-democracy/democracy-for-all-en.pdf, last accessed 25 February 2022

Clavin, A., N. Moore-Cherry and G. Mills (2021) 'Mapping green Dublin: Co-creating a greener future with local communities', *Urban Planning* **6**(4): 96-109

Cleave, E., M. Vecchio, D. Spilsbury and G. Arku (2019) 'Manufacturing change and policy

response in the contemporary economic landscape: How cities in Ontario, Canada, understand and plan for manufacturing', *Regional Studies, Regional Science* **6**(1): 469-495
Clifton, J., M. E. Warner, R. Gradus and G. Bel (2021) 'Re-municipalization of public services: trend or hype?', *Journal of Economic Policy Reform* **24**(3):293-304
Climate Bonds Initiative (2021) *Sustainable Debt Market Summary Q3 2021*, https://www.climatebonds.net/files/reports/cbi_susdebtsum_q32021_03b.pdf, last accessed 23 February 2022
Clinton, N., M. Stuhlmacher, A. Miles, N. Uludere Aragon, M. Wagner, M. Georgescu, C. Herwig and P. Gong (2018) 'A global geospatial ecosystem services estimate of urban agriculture', *Earth's Future* **6**(1): 40-60
Coalition for Urban Transitions (2019) *Climate Emergency, Urban Opportunity*, World Resources Institute (WRI) Ross Center for Sustainable Cities and C40 Cities Climate Leadership Group, London and Washington, DC, https://urbantransitions.global/urban-opportunity, last accessed 19 March 2022
Cobbinah, P. B. and V Nyame (2021) 'A city on the edge: The political economy of urban green space', *Environment and Urbanization* **33**(2): 413-435
Cohen, M. and L. Simet (2018) 'Macroeconomy and urban productivity' in T. Elmqvist, X. Bai, N. Frantzeskaki, C. Griffith, D. Maddox, T. McPhearson (eds) *Urban Planet. Knowledge towards Sustainable Cities*, Cambridge University Press, Cambridge, pp. 130-146
Cohen, M., and Habron, G (2018) 'How does the New Urban Agenda align with comprehensive planning in U.S. cities? A case study of Asheville, North Carolina', *Sustainability* **10**: 4590
Cohen-Shacham, E., J. Walters, S. Janzen, and S. Maginnis (2016) *Nature Based Solutions to Address Global Societal Challenges*. International Union for Conservation of Nature (IUCN), Gland, Switzerland
Cole, J. (2014) 'Polio and the Syrian crisis: The accidental bioterrorist', https://rusi.org/explore-our-research/publications/commentary/polio-and-syrian-crisis-accidental-bioterrorist, last accessed 4 May 2022
Collaço, F. M. A., L. P. Dias, S. G. Simoes, T. Puksek, J. Seixas and C. Bermann (2019) 'What if São Paulo (Brazil) would like to become a renewable and endogenous energy-based megacity?', *Renewable Energy* **138**: 416-433
Collaço, F. M. A., S. G. Simoes, L. Pereira Dias, N. Duic, J. Seixas and C. Bermann (2019) 'The dawn of urban energy planning – synergies between energy and urban planning for São Paulo (Brazil) megacity', *Journal of Cleaner Production* **215**: 458-479
Collado, J. R. N. and H. H. Wang (2020) 'Slum upgrading and climate change adaptation and mitigation: Lessons from Latin America', *Cities* **104**: 102791
Collier, P., V. Delbridge and S. Wani (2020) 'Making policy decisions under uncertainty', *International Growth Centre Blog*, https://www.theigc.org/blog/making-policy-decisions-under-uncertainty, last accessed 25 February 2022
Community Organizations Development Institute (2018) 'The Baan Mankong Collective Housing Program', https://en.codi.or.th/baan-mankong-collective-housing, last accessed 15 May 2022
Corburn, J. (2020) 'Health in all policies: Urban development, toxic stressors, and health equity' in R. Haring, I. Kickbusch, D. Ganten and M. Moeti (eds) *Handbook of Global Health*, pp. 1-24
Corburn, J. and A. Sverdlik (2017) 'Slum upgrading and health equity', *International Journal of Environmental Research and Public Health* **14**(4): 342
Corburn, J. and I. Karanja (2014) 'Informal settlements and a relational view of health in Nairobi, Kenya: Sanitation, gender and dignity', *Health Promotion International* **31**(2): 258-269
Corburn, J. and J. S. Griffin (2019) 'Richmond, California: Health in all urban policies', in S. Galea, C. K. Ettman and D. Vlahov (eds) *Urban Health*, Oxford University Press, Oxford, pp. 325-331
Corburn, J., and L. Riley (eds) (2016) *Slum health: From the cell to the street*, University of California Press, Oakland, California
Corburn, J., Asari, M. R., Pérez Jamarillo, J.and A. Gaviria (2020) 'The transformation of Medellin into a "City for Life:" insights for healthy cities', *Cities & Health*, **4**(1): 13-24
Cornell Tech (2021) '6 tech transformations that will shape future cities', https://tech.cornell.edu/news/6-tech-transformations-that-will-shape-future-cities/, last accessed 6 May 2022
Corridor Manchester (2020) 'Digital and smart cities', *Oxford Road Corridor*, 11 October, https://oxfordroadcorridor.com/knowledge/smart-cities/, last accessed 14 November 2021
Cortés-Cediel, M., I. Cantador and M. Rodríguez Bolívar (2021) 'Analyzing citizen participation and engagement in European smart cities', *Social Science Computer Review* **39**(4): 592-626
COVID Mobility Works (undated) 'Find mobility responses to COVID-19', http: //www.covidmobilityworks.org, last accessed 22 May 2022
Cradle to Cradle Certified (2017) 'Park 20|20: a leading example for built positive', https://www.c2ccertified.org/news/article/park-2020-a-leading-example-for-built-positive, last accessed 20 May 2022
Crane, M., S. Lloyd, A. Haines, D. Ding, E. Hutchinson, K. Belesova, M. Davies, D. Osrin, N. Zimmermann, A. Capon, P. Wilkinson and C. Turcu (2021) 'Transforming cities for sustainability: A health perspective', *Environment International* **147**: 106366
Crea, T. M., M. Loughry, C. O'Halloran and G. J. Flannery (2017) 'Environmental risk: Urban refugees' struggles to build livelihoods in South Africa', *International Social Work* **60**(3): 667-682
Creutzig, F., J. Roy, W. F. Lamb, I. M. L. Azevedo, W. B. De Bruin, H. Dalkmann, O. Y. Edelenbosch, F. W. Geels, A. Grubler and C. Hepburn (2018) 'Towards demand-side solutions for mitigating climate change', *Nature Climate Change* **8**(4): 260-263
Crivellaro, C., R. Anderson, D. Lambton-Howard, T. Nappey, P. Olivier, V. Vlachokyriakos, A. Wilson and P. Wright (2019) 'Infrastructuring public service transformation: Creating collaborative spaces between communities and institutions through HCI research', *ACM Transactions on Computer-Human Interaction* **26**(3)
Croese, S., C. Green and G. Morgan (2020) 'Localizing the Sustainable Development Goals through the lens of urban resilience: Lessons and learnings from 100 resilient cities and Cape Town', *Sustainability* **12:** 550
Cruz, N., P. Rode and M. McQuarrie (2019) 'New Urban Governance: A Review of Current Themes and Future Priorities', *Journal of Urban Affairs* **41**(1):1-19
Cruz Ruiz, E. (2021) 'Underrepresented Groups and Constitution-Making: The Mexico City case', *Political Studies Review* **19**(2): 164-170
Cucca, R. and C. Ranci (2021) 'Urban policy in times of crisis: The policy capacity of European cities and the role of multi-level governance', *Urban Affairs Review*, https://doi.org/10.1177%2F10780874211041710, last accessed 7 June 2022
Cuesta J., S. Devereux, A. Abdul-Gafaru, J. Gupte, L. P. Ragno, K. Roelen, R. Sabates-Wheeler, and T. Spadafora (2021) 'Urban social assistance: Evidence, challenges, and the way forward, with application to Ghana' *Development Policy Review* **39**: 360–380
Cui, J. (2020) 'The collaborative network among local governments in the Beijing-Tianjin-Hebei metropolitan area in PR China', in *Collaborative Governance of Local Governments in China*, Routledge, pp. 91-108
Cunningham, A. (2017) 'Public transportation of the future: Four new sustainable technologies' *Building Design and Construction,* 31 January, https://www.bdcnetwork.com/blog/public-transportation-future-four-new-sustainable-technologies, last accessed 19 March 2022
Curran, D. and A. Smart (2021) 'Data-driven governance, smart urbanism and risk-class inequalities: Security and social credit in China', *Urban Studies* **58**(3): 487–506
Curtis, S. (2018) 'Global cities and the ends of globalism', *New Global Studies* **12**(1): 75-90
Dachaga, W. and W. T Vries (2021) 'Land tenure security and health nexus: A conceptual framework for navigating the connections between land tenure security and health', *Land* **10**(3): 257
Dade-Robertson, M., A. Keren-Paz, M. Zhang and I. Kolodkin-Gal (2017) 'Architects of nature: growing buildings with bacterial biofilms', *Microbial Biotechnology* **10**(5): 1157-1163
Das, A. K and R. King (2019) *Surabaya: The Legacy of Participatory Upgrading of Informal Settlements*, World Resources Report Case Study, World Resources Institute, Washington, DC
Davis, K. (1965) 'The Urbanization of the Human Population', *Scientific American* **213**(3): 40-53
de Bree, G. J., A. van Sighem, W. Zuilhof, J. E. van Bergen, J. M. Prins, M. Heidenrijk, M. van der Valk, P. Brokx and P. Reiss (2019) 'Is reaching 90–90–90 enough to end AIDS? Lessons from Amsterdam', *Current Opinion in HIV and AIDS* **14**(6): 455-463
de Coninck, H., A. Revi, M. Babiker, P. Bertoldi, M. Buckeridge, A. Cartwright, W. Dong, J. Ford, S. Fuss and J.-C. Hourcade (2018) 'Strengthening and implementing the global response' *IPCC-The Intergovernmental Panel on Climate Change***:** 313-443
De Ceuvel (2022) 'Welcome to De Ceuvel', https://deceuvel.nl/en, last accessed 8 May 2022
de Filippi, F., C. Coscia and G. Cocina (2021) 'Digital participatory platforms for urban regeneration: A survey of italian case studies', *International Journal of E-Planning Research* **9**(3): 47-67
de Groot, J. and C. Lemanski (2020) 'COVID-19 responses: Infrastructure inequality and privileged capacity to transform everday life in South Africa,' *Environment and Urbanization* **33**(1): 255-272, https://doi.org/10.1177/0956247820970094
de Lannoy, L., R. E. Rhodes, S. A. Moore, G. Faulkner, and M. S. Tremblay (2020) 'Regional differences in access to the outdoors and outdoor play of Canadian children and youth during the COVID-19 outbreak', *Canadian Journal of Public Health*, **111**(6): 988–994
de Sousa Santos, B. (2015) *Epistemologies of the South: Justice against Epistemicide*, Routledge, London
de Vries, J. (2013) *European Urbanisation: 1500-1800,* Routledge, London
Debacker, W. and S. Manshoven (2016) *D1 Synthesis Report on the State-of-the-art Analysis: Key Barriers and Opportunities for Materials Passport and Reversible Building Design in the Current System*, Buildings as Material Banks, http: //www.bamb2020.eu/wp-content/uploads/2016/03/D1_Synthesis-report-on-State-of-the-art_20161129_FINAL.pdf, last accessed 6 June 2022
Deininger, N., Y. Lu, J. Griess and R. Santamaria (2019) *Cities Taking the Lead on the Sustainable Development Goals: A Voluntary Local Review Handbook for cities*, https://www.brookings.edu/wp-content/uploads/2019/07/VLR_Handbook_7.7.19.pdf, last accessed 6 May 2022
Delazeri, L. M. M., D. A. Da Cunha and L. R. Oliveira (2021) 'Climate change and rural–urban migration in the Brazilian Northeast region', *GeoJournal*: 1-21
Deloitte (2014) *Financial Sector Development for Promoting Investment and Sustainable Growth in Dubai*, Deloitte, London, https://www2.deloitte.com/content/dam/Deloitte/xe/Documents/

finance/me_DEC_%20Report_23122014.pdf, last accessed 3 May 2022
Deloitte (2020) *Urban Future with a Purpose: 12 Trends Shaping the Future of Cities by 2030*, Deloitte, London, https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Public-Sector/deloitte-urban-future-with-a-purpose-study-set2021.pdf, last accessed 3 May 2022
Deloitte (2021) *Urban Future with a Purpose*, Deloitte, London, https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Public-Sector/deloitte-urban-future-with-a-purpose-study-set2021.pdf, last accessed 23 April 2022
Demuth, J., H. Friederiszick and S. Reinhold (2021) 'Reverse privatization as a reaction to the competitive environment: Evidence from solid waste collection in Germany', *Review of Industrial Organization* **60**:217–261
Deng, T., K. Zhang and Z. J. M. Shen (2021) 'A systematic review of a digital twin city: A new pattern of urban governance toward smart cities', *Journal of Management Science and Engineering* **6**(2):125-134
Department for Transport (2019) *Future of Mobility: Urban Strategy*, Department for Transport, London
Designing Buildings (2020) '3D printing in construction', https://www.designingbuildings.co.uk/wiki/3D_printing_in_construction, last accessed 15 November 2021
Devereux, S. and J. Cuesta (2021) 'Urban-sensitive social protection: How universalized social protection can reduce urban vulnerabilities post COVID-19', *Progress in Development Studies*, **21**(4): 340-360
Devine-Wright, P., L. Pinto de Carvalho, A. di Masso, M. Lewicka, L. Manzo, and D. R. Williams (2020) '"Re-placed" - Reconsidering relationships with place and lessons from a pandemic', *Journal of Environmental Psychology* **72**: 101514
Dias, S. M. (2016) 'Waste pickers and cities', *Environment and Urbanization* **28**(2): 375-390
Diehl, E. (2015) 'Meta Mesh wants to get mesh network Wi-Fi to neighborhoods throughout Pittsburgh', *NEXTpittsburgh*, 22 June, https://nextpittsburgh.com/business-tech-news/meta-mesh-wants-to-get-mesh-network-wi-fi-to-neighborhoods-throughout-pittsburgh, last accessed 30 October 2021
Diez Roux, A. (2021) 'Urban Health Inequalities', in G. S. Lovasi, A. Diez Roux and J. Kolker (eds) *Urban Public Health: A Research Toolkit for Practice and Impact*, Oxford University Press, Oxford, pp. 78-105
Dijkstra, L., A. Florczyk, S. M. C. Freire, T. Kemper, M. Melchiorri, M. Pesaresi and M. Schiavina (2021) 'Applying the degree of urbanisation to the globe: A new harmonised definition reveals a different picture of global urbanisation', *Journal of Urban Economics* **125** (September 2021): 103312
Directorate-General for Research and Innovation, European Commission (2020) *Nature-based Solutions: State of The Art in EU Funded Projects*, European Commission, Luxembourg, https://op.europa.eu/en/publication-detail/-/publication/8bb07125-4518-11eb-b59f-01aa75ed71a1, last accessed 19 March 2022
Dobson, S., H. Nyamweru and D. Dodman (2015) 'Local and participatory approaches to building resilience in informal settlements in Uganda', *Environment and Urbanization* **27**(2): 605-620
Dodman, D., D. Archer and D. Satterthwaite (2019) 'Responding to climate change in contexts of urban poverty and informality', *Environment and Urbanization* **31**(1), https://doi.org/10.1177/0956247819830004, last accessed 9 June 2022
Dodman, D., I. Adelekan, D. Brown, H. Leck, M. Manda, B. Mberu, M. Pelling, M. Rusca, D. Satterthwaite and F. Taylor (2019) 'A spectrum of methods for a spectrum of risk: Generating evidence to understand and reduce urban risk in sub-Saharan Africa' *Area* **51**(3): 586-594
Doherty, B., Y. Sidhu, T. Heron, C. West, A. Seaton, J. Gulec, P. Prado and P. F. Martinez (2020) 'Citizen participation in food systems policy making: A case study of a citizens' assembly', *Emerald Open Research* **2**(22): 22
Dominguez, H., J. Mowry, E. Perez, C. Kendrick and K. Martin (2019) 'Privacy and information protection for a new generation of city services', in *Presentation to the 2nd ACM/EIGSCC Symposium on Smart Cities and Communities (SCC 2019)*, New York, USA
Domorenok, E., G. Acconcia, L. Bendlin and X. R. Campillo (2020) 'Experiments in EU climate governance: The unfulfilled potential of the covenant of mayors', *Global Environmental Politics* **20**(4): 122-142
Dorries, H., R. Henry, D. Hugill, T. McCreary and J. Tomiak (2019) *Settler city limits: Indigenous resurgence and colonial violence in the urban prairie west*, Univ. of Manitoba Press.
Dorst, H., A. van der Jagt, R. Raven and H. Runhaar (2019) 'Urban greening through nature-based solutions–Key characteristics of an emerging concept', *Sustainable Cities and Society* **49**: 101620
Du, Z., H. Zhang, Y. Ye, L. Jin and Q. Xu (2019) 'Urban shrinkage and growth: Measurement and determinants of economic resilience in the Pearl River Delta', *Journal of Geographical Sciences* **29**(8): 1331-1345
Dye, C. (2008) 'Health and urban living', *Science* **319**(5864): 766-769
Dyke, J., R. Watson and W. Knorr (2021) 'Climate scientists: Concept of net zero is a dangerous trap', *The Conversation,* 22 April, https://theconversation.com/climate-scientists-concept-of-net-zero-is-adangerous-trap-157368, last accessed 19 March 2022
Dyson, T. (2011) 'The role of the demographic transition in the process of urbanization', *Population and Development Review* **37**(Supplement): 34-54 https://doi.org/10.1111/j.1728-4457.2011.00377.x, last accessed 6 April 2022
Earle, L. (2016) 'Urban crises and the new urban agenda', *Environment and Urbanization*, **28**(1): 77-86
Ebi, K. L., A. Capon, P. Berry, C. Broderick, R. de Dear, G. Havenith, Y. Honda, R. S. Kovats, W. Ma, A. Malik, A. and N. B. Morris (2021) 'Hot weather and heat extremes: Health risks', *The Lancet* **398**(10301): 698-708
ECDC (European Centre for Disease Prevention and Control) (2021) *Communicable Disease Threats Report, 23-29 May 2021, Week 21,* https://www.ecdc.europa.eu/sites/default/files/documents/Communicable-disease-threats-report-29-may-2021.pdf, last accessed 24 March 2022
ECDC (2022) *Communicable Disease Threats Report, 2-8 January 2022, Week 1,* https://www.ecdc.europa.eu/sites/default/files/documents/Communicable-disease-threats-report-8-jan-2022.pdf, last accessed 24 March 2022
ECLAC (United Nations Economic Commission for Latin America and the Caribbean) (2021) *Social Panorama of Latin America 2020,* https://repositorio.cepal.org/bitstream/handle/11362/46688/8/S2100149_en.pdf, last accessed 4 May 2022
Edelman (2019) *2019 Edelman Trust Barometer: Global Report*, https://www.edelman.com/sites/g/files/aatuss191/files/2019-02/2019_Edelman_Trust_Barometer_Global_Report.pdf, last accessed 6 June 2022
Edenhofer, O. (2015) *Climate Change 2014: Mitigation of Climate Change*, Cambridge University Press, Cambridge
EDF (Environmental Defense Fund) (2021) *The Breathe London Blueprint: How Cities Can Use Hyperlocal Air Pollution Monitoring to Support Their Clean Air Goals*, Environmental Defense Fund, London, https://www.globalcleanair.org/files/2021/02/EDF-Europe-BreatheLondon_Blueprint-guide.pdf, last accessed 8 November 2021
EEA (European Environment Agency) (2021a) *Nature-Based Solutions in Europe. Policy, Knowledge and Practice for Climate Change Adaptation and Disaster Risk Reduction,* European Environment Agency, London, https://www.eea.europa.eu/publications/nature-based-solutions-in-europe, last accessed 19 March 2022
EEA (2021b) 'Digital technologies will deliver more efficient waste management in Europe', https://www.eea.europa.eu/themes/waste/waste-management/digital-technologies-will-deliver-more, last accessed 8 November 2021
Effat, H. A., M. S. Ramadan and R. H. Ramadan (2021) 'A spatial model for assessment of urban vulnerability in the light of the UN New Urban Agenda guidelines: case study of Assiut City, Egypt,' *Modeling Earth Systems and Environment*, https://doi.org/10.1007/s40808-021-01281-7
Eidelman, T. A. and S. Safransky (2020) 'The urban commons: A keyword essay', *Urban Geography*: 1-20
Elgendy, K and N. Abaza (2020) 'Urbanization in the MENA region: A benefit or a curse?', https://mena.fes.de/press/e/urbanization-in-the-mena-region-a-benefit-or-a-curse, last accessed 4 May 2022
Ellen MacArthur Foundation (2015) 'Circular economy would increase European competitiveness and deliver better societal outcomes, new study reveals', *PR Newswire*, 25 June, https://www.prnewswire.com/news-releases/circular-economy-would-increase-european-competitiveness-and-deliver-better-societal-outcomes-new-study-reveals-509738211.html, last accessed 3 May 2022
Ellis, P. and M. Roberts (2016) *Leveraging Urbanization in South Asia: Managing Spatial Transformation for Prosperity and Livability*, South Asia Development Matters, World Bank, Washington, DC
Elmqvist, T., E. Andersson, N. Frantzeskaki, T. McPhearson, P. Olsson, O. Gaffney, K. Takeuchi and C. Folke (2019) 'Sustainability and resilience for transformation in the urban century', *Nature Sustainability* **2**: 267-273
Elmqvist, T., H. Setälä, S. Handel, S. Van Der Ploeg, J. Aronson, J. N. Blignaut, E. Gomez-Baggethun, D. Nowak, J. Kronenberg and R. De Groot (2015) 'Benefits of restoring ecosystem services in urban areas', *Current Opinion in Environmental Sustainability* **14**: 101-108
Elmqvist, T., X. Bai, N. Frantzeskaki, C. Griffith, D. Maddox, T. McPhearson, S. Pharnell, P. Romero-Lankao, D. Simon and M. Watkins (eds) (2018) *Urban Planet: Knowledge Towards Sustainable Cities*, Cambridge University Press, Cambridge
Elrayies, G. M. (2018) 'Microalgae: prospects for greener future buildings', *Renewable and Sustainable Energy Reviews* **81**: 1175-1191
Eltarabily, S. and D. Elghezanwy (2020) 'Post-pandemic cities - the impact of COVID-19 on cities and urban design', *Architecture Research* **10**(3): 75-84
Eltis (2020) 'The SUMP Concept', https://www.eltis.org/mobility-plans/sump-concept, last accessed 25 February 2022
Ely, M., and S. Pittman (2014) *Green Infrastructure: Life Support for Human Habitats*, Botanic Gardens of South Australia, Australia
Emergency Governance Initiative (2020) *Policy Brief #01: Emergency governance for cities and regions,* https://www.lse.ac.uk/Cities/publications/Policy-Briefs-and-Analytics-Notes/Policy-Brief-01-Emergency-Governance-Initiative, last accessed 25 February 2022
Emergency Governance Initiative (2021a) *Policy Brief #03: Financing Emergencies in Cities and Regions: Ongoing Lessons from the Pandemic,* https://www.lse.ac.uk/Cities/publications/Policy-Briefs-and-Analytics-Notes/Policy-Brief-03-Emergency-Governance-Initiative, last accessed 25 February 2022
Emergency Governance Initiative (2021b) *Analytics Note #04: Multilevel Governance And Covid-19 Emergency Coordination,* https://www.lse.ac.uk/

Cities/publications/Policy-Briefs-and-Analytics-Notes/Analytics-Note-04-Multilevel-Governance-and-COVID-19-Emergency-Coordination, last accessed 05 May 2022

Engie (2020) 'How smart cities technology can help improve healthcare', https://innovation.engie.com/en/news/news/smart-cities/smart-cities-technology-healthcare/13698, last accessed 8 November 2021

Enssle, F. and N. Kabisch (2020) 'Urban green spaces for the social interaction, health and well-being of older people—An integrated view of urban ecosystem services and socio-environmental justice', *Environmental Science & Policy* **109**: 36-44

Environment Agency (2021) *Living Better with a Changing Climate; Report to Ministers Under the Climate Change Act*, Environment Agency, Bristol

Erika C. P., S. Greene, C. Stacy, T. Srini, B. Meixell, S. Brown, and D. Elliott (2018) *Inclusive Recovery in US Cities*, Research Report, Urban Institute, Washington, DC, https://www.urban.org/sites/default/files/publication/97981/inclusive_recovery_in_us_cities_0.pdf, last accessed 4 May2022

Ertiö, T.-P. (2015) 'Participatory apps for urban planning—space for improvement', *Planning Practice & Research* **30**(3): 303-321

Eruchalu, C., M. Pichardo, M. Bharadwaj, C. Rodriguez, J. Rodriguez, R. Bergmark, D. Bates and G. Ortega (2021) 'The expanding digital divide: Digital health access inequities during the COVID-19 pandemic in New York City', *Journal of Urban Health* **98**: 183-186

Eskelinen, J., A. García Robles, I. Lindy, J. Marsh and A. Muente-Kunigami (2015) *Citizen-Driven Innovation: A Guidebook for City Mayors and Public Administrators*, International Bank for Reconstruction and Development, World Bank and European Network of Living Labs, Washington, DC

Esponda, G. M., Hartman, S., Qureshi, O., Sadler, E., Cohen, A. and R. Kakuma (2020) 'Barriers and facilitators of mental health programmes in primary care in low-income and middle-income countries', *The Lancet Psychiatry* **7**(1), 78-92

Euronews (2021) 'New robots patrolling for 'anti-social behaviour' causing unease in Singapore streets', *Euronews*, 8 October, https://www.euronews.com/next/2021/10/08/new-robots-patrolling-for-anti-social-behaviour-causing-unease-in-singapore-streets, last accessed 11 October 2021

European Commission (2018) *A Clean Planet For All, a European Strategic Long-Term Vision for a Prosperous, Modern, Competitive and Climate Neutral Economy*, European Commission, Brussels

European Commission (2020) *Circular Economy Action Plan: For a Cleaner and more competitive Europe,* Publications Office of the European Union, Luxembourg, https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf, last accessed 19 March 2022

European Commission (2021) 'A new step towards setting up of the European Urban Initiative supported by ERDF', https://ec.europa.eu/regional_policy/en/newsroom/news/2021/05/05-10-2021-a-new-step-towards-setting-up-of-the-european-urban-initiative-supported-by-erdf, last accessed 23 May 2022

European Commission (2022) 'Smart cities', https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en, last accessed 6 June 2022

European Commission (undated) 'Nature-based solutions', https://ec.europa.eu/info/research-and-innovation/research-area/environment/nature-based-solutions_en, last accessed 6 June 2022

European Commission and LSE (2020) *Demographic and health outcomes by degree of urbanisation: Perspectives from a new classification of urban areas,* Publications Office of the European Union, Luxembourg, https://data.europa.eu/doi/10.2776/37532, last accessed 6 April 2022

European Commission, Directorate-General for Environment (2017) *The Precautionary Principle: Decision-Making Under Uncertainty*, Future Brief in Science for Environment Policy, No. 18, Publications Office of the European Union, Luxembourg, https://data.europa.eu/doi/10.2779/709033

European Network of Living Labs (2020) '2020 Activity Report: A review of the activities of the European Network of Living Labs', https://issuu.com/enoll/docs/activity_report_2020, last accessed 12 February 2022

European Space Agency (2022) 'Air pollution drops in India following lockdown', https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-5P/Air_pollution_drops_in_India_following_lockdown, last accessed 20 February 2022

European Union (2021) *Local and Regional Finances in the Aftermath of COVID-19*, Publications Office of the European Union, Luxembourg, https://op.europa.eu/en/publication-detail/-/publication/a97258db-d887-11eb-895a-01aa75ed71a1/language-en/format-PDF/source-220490275, last accessed 3 May 2022

European Union, FAO, UN-Habitat, OECD, and World Bank (2021) *Applying the Degree of Urbanisation — A Methodological Manual to Define Cities, Towns and Rural Areas for International Comparisons,* 2021 Edition, Publications Office of the European Union, Luxembourg

Eurostat (2021) *2021 Demography of Europe*, Publications Office of the European Union, Luxembourg, https://ec.europa.eu/eurostat/cache/digpub/demography/img/pdf/Demograhy-InteractivePublication-2021_en.pdf?lang=en, last accessed 23 April 2022

Evans, J., A. Karvonen, A. Luque-Ayala, C. Martin, K. McCormick, R. Raven, and Y. Voytenko Palgan (2019) 'Smart and sustainable cities? Pipedreams, practicalities and possibilities', *Local Environment* **24**(7): 557-564

Evans, J., J. O'Brien and B. C. Ng (2018) 'Towards a geography of informal transport: Mobility, infrastructure and urban sustainability from the back of a motorbike', *Transactions of the Institute of British Geographers* **43**(4): 674-688

Evans, J., T. Vacha, H. Kok and K. Watson (2021) 'How Cities Learn: From Experimentation to Transformation', *Urban Planning* **6**(1): 171-182

Ewing, K., S. Potgieter, H. Duker, D. Pope and C. Comrie (2015) 'Violence prevention through urban upgrading', *Architecture South Africa* (71): 28-30

Eyre, N., S. J. Darby, P. Grünewald, E. McKenna and R. Ford (2018) 'Reaching a 1.5 C target: socio-technical challenges for a rapid transition to low-carbon electricity systems', *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* **376**(2119): 20160462

Ezeh, A., O. Oyebode, D. Satterthwaite, Y. F. Chen, R. Ndugwa, J. Sartori, B. Mberu, G. J. Melendez-Torres, T. Haregu, S. I. Watson and W. Caiaffa, (2017) 'The history, geography, and sociology of slums and the health problems of people who live in slums', *The Lancet* **389**(10068): 547-558

Fang, D., S. Pan, Z. Li, T. Yuan, B. Jiang, D. Gan, B. Sheng, J. Han, T. Wang, and Z. Liu (2020) 'Large-scale public venues as medical emergency sites in disasters: Lessons from COVID-19 and the use of Fangcang shelter hospitals in Wuhan, China', *BMJ Global Health* **5**(6): e002815

FAO (Food and Agriculture Organization) (2022) 'The City-Region-Food-Systems approach', https://www.fao.org/in-action/food-for-cities-programme/overview/crfs/en/#: ~: text=City%2Dregion%20food%20system,communities%20can%20be%20directly%20linked., last accessed 1 May 2022

FAO and RUAF Foundation (2015) *A Vision for City Region. Food Systems; Building Sustainable and Resilient City Regions*, http://www.fao.org/3/a-i4789e.pdf, last accessed 7 June 2022

Farrell, K. (2017) 'The rapid urban growth triad: A new conceptual framework for examining the urban transition in developing countries', *Sustainability* **9**(8): 1407 https://doi.org/10.3390/su9081407, last accessed 6 April 2022

Farrell, K. (2018) 'An inquiry into the nature and causes of Nigeria's rapid urban transition' *Urban Forum* **29**(3): 277-298, https://doi.org/10.1007/s12132-018-9335-6, last accessed 6 April 2022

Farrell, K. and H. Westlund (2018) 'China's rapid urban ascent: An examination into the components of urban growth', *Asian Geographer* **35**(1): 85-106 https://doi.org/10.1080/10225706.2018.1476256, last accessed 6 April 2022

Fay, M. and C. Opal (1999) *Urbanization without Growth: A Not-So-Uncommon Phenomenon*, World Bank, Washington, DC, https://doi.org/10.1596/1813-9450-2412, last accessed 6 April 2022

Federal Ministry of Labour, Social Affairs and Consumer Protection (2014) 'Social Protection in Austria, 2014', https://www.sozialministerium.at/en.html, last accessed 13 Dec 2021

Federation of Canadian Municipalities (2022) 'International Programs', https://fcm.ca/en/programs/international-programs, last accessed 8 May 2022

Federgruen, A. and S. Naha, (2021) 'Crowding effects dominate demographic attributes in COVID-19 cases', *International Journal of Infectious Diseases* **102**: 509–516

Feichtinger, S. and M. Gronalt (2021) 'The environmental impact of transport activities for online and in-store shopping: A systematic literature review to identify relevant factors for quantitative assessments', *Sustainability* **13**(2918)

Fell, T., T. Rydenstam, B. Geleta Buli, A. King and K. Bälter (2021) 'Citizen science in Sweden's stigmatized neighborhoods', *Sustainability* **13**: 10205

Feltenstein, A and B. K. Dalta (2020) 'Broad-based subsidies or targeted transfers? Distributional equity vs macroeconomic costs, *Journal of Economic Policy Reform*: 1–18, doi.org/10.1080/17487870.2020.1785299

Ferdous, F. (2021) 'Redesigning memory care in the COVID-19 era: Interdisciplinary spatial design interventions to minimize social isolation in older adults', *Journal of Aging and Social Policy* **33**(4–5): 555–569

Fernández, C., F. Manyà, C. Mateu and F. Sole-Mauri (2015) 'Approximate dynamic programming for automated vacuum waste collection systems', *Environmental Modelling & Software* **67**: 128-137

Feroz, A. S., A. Khoja and S. Saleem (2021) 'Equipping community health workers with digital tools for pandemic response in LMICs', *Archives of Public Health* **79**(1): 1- 4

Fezi, B. A. (2020) 'Health engaged architecture in the context of COVID-19', *Journal of Green Building* **15**(2): 185–212

Fincher, R. and K. Iveson (2008) *Planning and Diversity in the City: Redistribution, Recognition and Encounter*, Macmillan International Higher Education

Firth, C. L., B. Baquero, R. Berney, K. D. Hoerster, S. J. Mooney and M. Winters (2021) 'Not quite a block party: COVID-19 street reallocation programs in Seattle, WA and Vancouver, BC', *SSM - Population Health* **14**: 100769

Fisher, E. (2020) 'Reinventing responsible innovation', *Journal of Responsible Innovation* **7**(1): 1-5

Fisher-Post, M. (2020) *What's New About Inequality in Australia, Canada, New Zealand, and the United States?,* World Inequality Lab-Issue Brief 2020-07, World Inequality Lab, https://wid.world/document/whats-new-about-inequality-in-australia-canada-new-zealand-and-the-united-states-world-inequality-lab-issue-brief-2020-07/, last accessed 4 May 2022

Fleming, W. (2021) 'Europe's first full-sized self-driving urban electric bus has arrived', https://www.weforum.org/agenda/2021/03/europe-first-autonomous-electric-buses-spain/, last accessed 8 November 2021

Florida, R. (2019) 'How some shrinking cities are still prospering', *Bloomberg*, 13 July, https://www.bloomberg.com/news/articles/2019-06-13/some-cities-are-getting-smaller-richer-and-elite, last accessed 23 April 2022

Florida, R., A. Rodríguez-Pose and M. Storper (2020) *Cities in a Post-COVID World*, Papers in Evolutionary Economic Geography, http: //econ.geo.uu.nl/peeg/peeg2041.pdf, last accessed 23 April 2022

Florida, R., A. Rodríguez-Pose and M. Storper (2021) 'Cities in a post-COVID world', *Urban Studies* **00**(0): 1-23

Florida, R., P. Adler and C. Mellander (2017) 'The city as innovation machine', *Regional Studies* **51**(1)

Flyvbjerg, B., M. K. Skamris Holm and S. L. Buhl (2006) 'Inaccuracy in traffic forecasts', *Transport Reviews* **26**(1): 1-24

Fonseca, E. and M. Whitney (2021) '5 ways new monitoring technologies can help cities combat air pollution', World Economic Forum, https://www.weforum.org/agenda/2021/04/air-pollution-cities-monitoring-technologies/, last accessed 8 November 2021

Font, J. and I. Blanco (2007) 'Procedural legitimacy and political trust: The case of citizen juries in Spain', *European Journal of Political Research* **46**(4): 557-589

Ford, J. D., L. Cameron, J. Rubis, M. Maillet, D. Nakashima, A. C. Willox and T. Pearce (2016) 'Including indigenous knowledge and experience in IPCC assessment reports', *Nature Climate Change* **6**(4): 349-353

Forero, R. and R. Sietchiping (2022) 'Metropolises Overcoming the COVID-19 Pandemic: An urgent call for territorializing global agendas at subnational levels', in Nunes, C. (Ed), *Local Government and the COVID-19 Pandemic: A Global Perspective*, Springer International Publishing

Forouzanfar, M. H., A. Afshin, L. T. Alexander, H. R. Anderson, Z. A. Bhutta, S. Biryukov, M. Brauer, R. Burnett, K. Cercy and F. J. Charlson (2016) 'Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2015: A systematic analysis for the Global Burden of Disease Study 2015', *The Lancet* **388**(10053): 1659-1724

Forster, P. M., A. C. Maycock, C. M. McKenna and C. J. Smith (2020) 'Latest climate models confirm need for urgent mitigation', *Nature Climate Change* **10**(1): 7-10

Fortes, P., A. Alvarenga, J. Seixas and S. Rodrigues (2015) 'Long-term energy scenarios: Bridging the gap between socio-economic storylines and energy modeling', *Technological Forecasting and Social Change* **91**: 161-178

Fortune Business Insights (2021) *IoT in Smart Cities Market Size, Share & Covid-19 Impact Analysis,* Fortune Business Insights, https://www.fortunebusinessinsights.com/iot-in-smart-cities-market-105029, last accessed 8 November 2021

Foth, M., I. Anastasiu, M. Mann and P. Mitchell (2021) 'From automation to autonomy: Technological sovereignty for better data care in smart cities', in B. T. Wang and C. M. Wang (eds) *Automating Cities*, Springer Nature, Singapore, pp. 319-343

Fouad, M.N., G.R. Oates, I.C. Scarinci, W.Demark-Wahnefried, B.W. Hamby, L.B. Bateman, J.J. Estrada, M. Payton, M. Sims, L. Miele and E.E. Partridge (2017) 'Advancing the science of health disparities through research on the social determinants of health' *American Journal of Preventive Medicine* **52**(Supp. 1): S1-S4

Fox, A., G. Ziervogel and S. Scheba (2021) 'Strengthening community-based adaptation for urban transformation: Managing flood risk in informal settlements in Cape Town', *Local Environment*: 1-15

Fox, S. (2012) 'Urbanization as a global historical process: Theory and evidence from Sub-Saharan Africa', *Population and Development Review* **38**(2): 285-310 https://doi.org/10.1111/j.1728-4457.2012.00493.x, last accessed 6 April 2022

Foxon, T. J. (2013) 'Transition pathways for a UK low carbon electricity future', *Energy Policy* **52**: 10-24

Francese, M. and D. Prady (2018) Universal basic income: Debate and impact assessment, Working Paper, No. WP/18/273, *International Monetary Fund*, Washington, DC, https://www.imf.org/-/media/Files/Publications/WP/2018/wp18273.ashx, last accessed 11 April 2022

Frank, M., L. Sun, M. Cebrian, H. Youn and I. Rahwan (2018) 'Small cities face greater impact from automation', *Journal of The Royal Society Interface* **15**: 20170946

Frantzeskaki, N. and T. McPhearson (2021) 'Mainstream nature-based solutions for urban climate resilience', *BioScience* **72**(2): 113-115 https://doi.org/10.1093/biosci/biab105

Fraser, T., Bancroft, M., Small, A. and Cunningham, L. (2022) 'Leaders or networkers? The role of mayors in renewable energy transition', *Environmental Innovation and Societal Transitions* (**42**): 301-316, https://doi.org/10.1016/j.eist.2022.01.003

Fratesi, U. and A. Rodríguez-Pose (2016) 'The crisis and regional employment in Europe: What role for sheltered economies?', *Cambridge Journal of Regions, Economy, and Society* **9**(1): 33–57

Frederick S. and Pardee Center for International Futures (2022) 'International Futures Platform' *University of Denver*, https://www.ifs.du.edu/ifs/frm_MainMenu.aspx, last accessed 14 May 2022

Fredholm, S. (2015) 'Negotiating a dominant heritage discourse. Sustainable urban planning in Cape Coast, Ghana', *Journal of Cultural Heritage Management and Sustainable Development* **5**(3): 274-289

Freedom House (2022) *Freedom in the World 2022: The Global Expansion of Authoritarian Rule*, https://freedomhouse.org/report/freedom-world/2022/global-expansion-authoritarian-rule, last accessed 22 March 2022

Freeth, R. and S. Drimie (2016) 'Participatory scenario planning: From scenario "stakeholders" to scenario "owners"', *Environment: Science and Policy for Sustainable Development* **58**(4): 32-43

Freire, M.E. Lall, S. and D. Leipziger, (2014) *Africa's Urbanization: Challenges and Opportunities*, Working Paper Number 7, The Growth Dialogue, Washington, DC

Frem, J., V. Rajadhyaksha and J. Woetzel (2018) 'Thriving amid turbulence: Imagining the cities of the future', https://www.mckinsey.com/industries/public-sector/our-insights/thriving-amid-turbulence-imagining-the-cities-of-the-future, last accessed 6 May 2022

Frey, C. and M. Osborne (2017) 'The future of employment: How susceptible are jobs to computerisation?', *Technological Forecasting & Social Change* **114**: 254-280

Friel, S., M. Akerman, T. Hancock, J. Kumaresan, M. Marmot, T. Melin and D. Vlahov (2011) 'Addressing the social and environmental determinants of urban health equity: Evidence for action and a research agenda', *Journal of Urban Health* **88**(5): 860-874

Fu, X., M. Gomaa, Y. Deng, and Z-R. Peng (2016) 'Adaptation planning for sea level rise: A study of US coastal cities', *Journal of Environmental Planning and Management* **60**(2): 249-265

Fuentes, S., E. Tongson and C. Gonzalez Viejo (2021) 'Urban green infrastructure monitoring using remote sensing from integrated visible and thermal infrared cameras mounted on a moving vehicle', *Sensors* **21**: 295

Fuller, B. and P. Romer (2014) *Urbanization as Opportunity*, Policy Research Working Paper No. 6874, World Bank, Washington, DC, https://openknowledge.worldbank.org/handle/10986/18743, last accessed 6 April 2022

Fund for Peace (2021) 'Fragile states index: Measuring fragility risk and vulnerability in 179 countries', *Fragile States Index*, https://fragilestatesindex.org/, last accessed 5 May 2022

Fünfgeld, H. (2015) 'Facilitating local climate change adaptation through transnational municipal networks', *Current Opinion in Environmental Sustainability* **12**: 67-73

Furceri, D., Loungani, P. and J. D. Ostry (2020) 'How pandemics leave the poor even farther behind', *IMF Blog*, 11 May, https://blogs.imf.org/2020/05/11/how-pandemics-leave-the-poor-even-farther-behind/, last accessed 23 April 2022

G20 (2018) *G20 Policy Guide: Digitisation and informality: Harnessing Digital Financial Inclusion for Individuals and MESMEs in the Informal Economy*, Global Partnership for Financial Inclusion, https://www.gpfi.org/sites/gpfi/files/documents/G20_Policy_Guide_Digitisation_and_Informality.pdf, last accessed 8 November 2021

Gabriel, K. and W. Endlicher (2011) 'Urban and rural mortality rates during heatwaves in Berlin and Brandenburg, Germany', *Environmental Pollution* **159**(8-9): 2044-2050

Gabrys, J. (2014) 'Programming Environments: Environmentality and Citizen Sensing in the Smart City', *Environment and Planning D: Society and Space* **32**(1): 30-48

Gagné, S. A. (2013) 'The distinguishing features of the study of the ecology of urban landscapes', *Geography Compass* **7**(4): 266-286

Gago, E. J., T. Muneer, M. Knez and H. Köster (2015) 'Natural light controls and guides in buildings. Energy saving for electrical lighting, reduction of cooling load', *Renewable and Sustainable Energy Reviews* **41**: 1-13

Gallent, N. and M. Madeddu (2021) 'COVID-19 and London's decentralising housing market – what are the planning implications?', *Planning Practice and Research* **36**(5): 567-577

Ganzleben, C. and A. Kazmierczak (2020) 'Leaving no one behind–understanding environmental inequality in Europe', *Environmental Health* **19**: 1-7

Garrard, G. E., N. S. Williams, L. Mata, J. Thomas and S. A. Bekessy (2018) 'Biodiversity sensitive urban design', *Conservation Letters* **11**(2): e12411

Gasper, R., A. Blohm and M. Ruth (2011) 'Social and economic impacts of climate change on the urban environment', *Current Opinion in Environmental Sustainability* **3**(3): 150-157

GBD 2019 Mental Disorders Collaborators (2022) 'Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990-2019: A systematic analysis from the Global Burden of Disease Study 2019', *The Lancet Psychiatry* **9**(2): 137-150

Geels, F. W. (2005) *Technological Transitions and System Innovations: A Co-Evolutionary and Socio-Technical Analysis*, Edward Elgar Publishing, Cheltenham, UK

Geels, F. W., A. McMeekin and B. Pfluger (2020) 'Socio-technical scenarios as a methodological tool to explore social and political feasibility in low-carbon transitions: Bridging computer models and the multi-level perspective in UK electricity generation (2010–2050)', *Technological Forecasting and Social Change* **151**: 119258

Geels, F. W., F. Berkhout and D. P. Van Vuuren (2016) 'Bridging analytical approaches for low-carbon transitions', *Nature Climate Change* **6**(6): 576-583

Gentilini, U. (2015) *Entering the City: Emerging Evidence and Practices with Safety Nets in Urban Areas,* World Bank Social Protection and Labor Discussion Paper, No. 1504, World Bank, Washington, DC, https://openknowledge.worldbank.org/bitstream/handle/10986/22482/Entering0the0c00nets0in0urban0areas.pdf?sequence=1&isAllowed=y, last accessed 4 May 2022

Gentilini, U., S. Khosla, and M. Almenfi (2021) *Cash in the City Emerging Lessons from Implementing Cash Transfers in Urban Africa*, Discussion Paper, No. 2101, World Bank, DC, https://openknowledge.worldbank.org/bitstream/handle/10986/35003/Cash-in-the-City-Emerging-Lessons-from-Implementing-Cash-Transfers-

in-Urban-Africa.pdf?sequence=1&isAllowed=y, last accessed May 5

Gentilini, U., M. Almenfi, I. Orton, and P. Dale (2020) *Social Protection and Jobs Responses to COVID-19: A Real-Time Review of Country Measures*, World Bank, Washington, DC

Gesesew, H., K. Berhane, E. S. Siraj, D. Siraj, M. Gebregziabher, Y. G. Gebre, S. A. Gebreslassie, F. Amdes, A.G. Tesema, A. Siraj and M. Aregawi (2021) 'The impact of war on the health system of the Tigray region in Ethiopia: An assessment', *BMJ Global Health* **6**(11): e007328

Gesing, F. (2018) 'Transnational municipal climate networks and the politics of standardisation: The contested role of climate data in the new global covenant of mayors for climate and energy', *Politics and Governance* **6**(3): 126-135

Ghebreyesus, T. A. and U. von der Leyen (2020) 'A global pandemic requires a world effort to end it – none of us will be safe until everyone is safe', https://www.who.int/news-room/commentaries/detail/a-global-pandemic-requires-a-world-effort-to-end-it-none-of-us-will-be-safe-until-everyone-is-safe, last accessed 6 June 2022

Ghertner, D. A. (2010) 'Calculating without numbers: Aesthetic governmentality in Delhi's slums', *Economy and Society* **39**(2): 185-217

Ghosh, B. and S. Arora (2021) 'Smart as (un)democratic? The making of a smart city imaginary in Kolkata, India', *EPC: Politics and Space* **0**(0): 1-21

Ghosh, D. and B. Das (2020) 'A Study on the Issue of Blockchain's Energy Consumption', *Advances in Intelligent Systems and Computing* **1065**: 63-75

Gill, T. (2021) 'Ethical dilemmas are really important to potential adopters of autonomous vehicles', *Ethics and Information Technology* **7**: 1-17

Gilman, H. (2016) *Engaging Citizens: Participatory Budgeting And The Inclusive Governance Movement Within The United States'*, Occasional Paper Series, Harvard Kennedy School Ash Center for Democratic Governance and Innovation, Cambridge, Massachusetts

Girma, Y., H. Terefe, S. Pauleit and M. Kindu (2019) 'Urban green spaces supply in rapidly urbanizing countries: The case of Sebeta Town, Ethiopia', *Remote Sensing Applications: Society and Environment* **13**: 138-149

Gitahi, G. and C. Cashin (2020) 'Universal Health Coverage' in R. Haring, I. Kickbusch, D. Ganten and M. Moeti (eds) *Handbook of Global Health*. Springer, Switzerland, pp. 1611 - 1649

GIZ (2014) *Urban Mobility Plans: National Approaches and Local Practices,* Gesellschaft für Internationale Zusammenarbeit, New Delhi, https://sutp.org/publications/urban-mobility-plans-national-approaches-and-local-practices/, last accessed 19 March 2022

GIZ (2017) *Green Municipal Bonds in India: Potential, Barriers and Advantages*, Deutsche Gesellschaft für Internationale Zusammenarbeit, New Delhi, https://www.niua.org/csc/assets/pdf/RepositoryData/UP_Green_Cover/GIZ_Green_Municipal_Bonds_eReport.pdf, last accessed 11 May 2022

GIZ (2019) *Sustainable Urban Transport: Avoid-Shift-Improve (A-S-I),* Gesellschaft für Internationale Zusammenarbeit, New Delhi, https://www.transformative-mobility.org/assets/publications/ASI_TUMI_SUTP_iNUA_No-9_April-2019.pdf, last accessed 19 March 2022

GIZ (2020a) *Artificial Intelligence in Urban Development*, Gesellschaft für Internationale Zusammenarbeit, Bonn and Eschborn

GIZ (2020b) *Digital transformation in the informal economy: Opportunities and challenges for technical and vocational education and training in development cooperation*, Gesellschaft für Internationale Zusammenarbeit, New Delhi, Bonn

GIZ and UN-Habitat (2015) 'Unpacking Metropolitan Governance for Sustainable Development: Discussion Paper', Eschborn: GIZ, https://thehagueacademy.com/wp-content/uploads/2016/01/GIZ-and-UN-Habitat-2015-Unpacking-Metropolitan-Governance-for-Sustainable-Development.pdf, last accessed 25 February 2022

Glaeser, E. and D. Cutler (2021) *Survival of the City: Living and Thriving in Age of Isolation*, Penguin, New York

Glaeser, E. L. (2014) 'A world of cities: The causes and consequences of urbanization in poorer countries', *Journal of the European Economic Association* **12**(5): 1154-1199, https://doi.org/10.1111/jeea.12100, last accessed 6 April 2022

Glaeser, E. L. and W. Xiong (2017) *Urban Productivity in the Developing World*, Working Paper, No. 23279, National Bureau of Economic Research, Cambridge, United States of America

Glaeser, E. L., C. Gorback and S.J. Redding (2021) 'JUE Insight: How much does COVID-19 increase with mobility? Evidence from New York and four other U.S. cities, *Journal of Urban Economics* **127**: 103292, https://doi.org/10.1016/j.jue.2020.103292

Glass, L. M. and J. Newig (2019) 'Governance for achieving the SDGs: How important are participation, policy coherence, reflexivity, adaptation and democratic institutions?' *Earth System Governance Journal* **2**:1-14

Glazener, A., J. Wylie, W. van Waas, and H. Khreis (2022) 'The impact of car-free days and events on the environment and human health', *Built Environment and Health* **9**: 165-182

Global Commission on Adaptation (2019) *Adapt Now: A Global Call for Leadership on Climate Resilience*, Global Center on Adaptation and World Resources Institute, Hague, https://cdn.gca.org/assets/2019-09/GlobalCommission_Report_FINAL.pdf, last accessed 23 April 2022

Global Infrastructure Initiative (2021) *Re-imagining Transit in a Post-COVID World*, McKinsey & Company, https://www.mckinsey.com/~/media/mckinsey/business%20functions/operations/our%20insights/voices%20on%20infrastructure%20reimagining%20transit%20in%20a%20post%20covid%20world/voices-gii-june-2021.pdf, last accessed 1 May 2022

Global Platform for Sustainable Cities and World Bank (2018) *Urban Sustainability Framework*, 1st edition, World Bank, Washington, DC

GNESD (Global Network on Energy for Sustainable Development) (2014) *Country Report (Brazil). Energy Poverty in Developing Countries' Urban Poor Communities: Assessments and Recommendations. Urban and Peri-Urban Energy Access III,* CENBIO/USP, Centro Clima/COPPE/UFRJ and POLICOM/POLI/UPE

Gobierno de la Ciudad de Buenos Aires (2018) 'Buenos Aires resiliente', http://www.buenosaires.gob.ar/jefedegobierno/secretariageneral/buenos-aires-ciudad-resiliente, last accessed 11 May 2022

Goddard, M. A., Z. G. Davies, S. Guenat, M. J. Ferguson, J. C. Fisher, A. Akanni, T. Ahjokoski, P. M. L. Anderson, F. Angeoletto, C. Antoniou, A. J. Bates, A. Barkwith, A. Berland, C. J. Bouch, C. C. Rega-Brodsky, L. B. Byrne, D. Cameron, R. Canavan, T. Chapman, S. Connop, S. Crossland, M. C. Dade, D. A. Dawson, C. Dobbs, C. T. Downs, E. C. Ellis, F. J. Escobedo, P. Gobster, N. M. Gulsrud, B. Guneralp, A. K. Hahs, J. D. Hale, C. Hassall, M. Hedblom, D. F. Hochuli, T. Inkinen, I.-C. Ioja, D. Kendal, T. Knowland, I. Kowarik, S. J. Langdale, S. B. Lerman, I. MacGregor-Fors, P. Manning, P. Massini, S. McLean, D. D. Mkwambisi, A. Ossola, G. P. Luque, L. Pérez-Urrestarazu, K. Perini, G. Perry, T. J. Pett, K. E. Plummer, R. A. Radji, U. Roll, S. G. Potts, H. Rumble, J. P. Sadler, S. de Saille, S. Sautter, C. E. Scott, A. Shwartz, T. Smith, R. P. H. Snep, C. D. Soulsbury, M. C. Stanley, T. Van de Voorde, S. J. Venn, P. H. Warren, C.-L. Washbourne, M. Whitling, N. S. G. Williams, J. Yang, K. Yeshitela, K. P. Yocom, and M. Dallimer (2021) 'A global horizon scan of the future impacts of robotics and autonomous systems on urban ecosystems', *Nature Ecology & Evolution* **5**: 219-230

Godfrey, L., W. Strydom and R. Phukubye (2016) *Integrating the Informal Sector into the South African Waste and Recycling Economy in the Context of Extended Producer Responsibility,* Briefing Note, Council of Scientific and Industrial Research, South Africa, https://www.wasteroadmap.co.za/download/informal_sector_2016.pdf, last accessed 27 February 2022

Goodess, C., S. Berk, S. B. Ratna, O. Brousse, M. Davies, C. Heaviside, G. Moore and H. Pineo (2021) 'Climate change projections for sustainable and healthy cities', *Buildings & Cities* **2**(1): 812

Gordon, D. J. and C. A. Johnson (2017) 'The orchestration of global urban climate governance: Conducting power in the post-Paris climate regime', *Environmental Politics* **26**(4): 694-714

Gorelick, J. (2018) 'Supporting the Future of Municipal Bonds in Sub-Saharan Africa: The Centrality of Enabling Environments and Regulatory Frameworks', *Environment and Urbanization* **30**(1):103-122

Gornitzka, C. P., R. Piper and U. Modéer (2020) 'Global solidarity & effective cooperation in the face of COVID-19', *IPS-Inter Press Service*, 9 June, https://www.ipsnews.net/2020/06/global-solidarity-effective-cooperation-face-covid-19, last accessed 19 March 2022

Göteborgs Stad (2020) 'Granskningsförslag ny översiktsplan', *Göteborgs Stad*, https://oversiktsplan.goteborg.se, last accessed, 11 May 2022

Gould, K. and T. Lewis (2016) *Green Gentrification: Urban Sustainability and the Struggle for Environmental Justice*, Routledge, London

Gourinchas, Pierre-Olivier (2022) 'War dims global economic outlook as inflation accelerates', *IMF Blog*, 19 April, https://blogs.imf.org/2022/04/19/war-dims-global-economic-outlook-as-inflation-accelerates, last accessed 6 May 2022

Government of People's Republic of Bangladesh (2020*) Urban Social Protection Strategy and Action Plan in Bangladesh,* Social Security Policy Support (SSPS) Programme, Cabinet Division and General Economics Division, Dhaka

Government of Singapore (2021) *'Skills future Singapore'*, Skillfuture Singapore, https://www.skillsfuture.gov.sg/, last accessed 25 October 2021

Government of the Democratic Social Republic of Sri Lanka (2018) *State of Sri Lankan Cities 2018 Report*, UN-Habitat, Colombo

Grace, D. and Jones (2011) *Zoonoses: Wildlife Domestic Animal Interactions*, Report to DFID, International Livestock Research Institute and Royal Veterinary College, Nairobi and London

Gradín, C, F. Tarp, and M. Leibbrandt (2021) 'Global inequality may be falling, but the gap between haves and have-nots is growing', *The Conversation*, 2 September, https://theconversation.com/global-inequality-may-be-falling-but-the-gap-between-haves-and-have-nots-is-growing-159825, last accessed 4 May 2022

Graff, A. (2021) 'San Francisco makes four Slow Streets permanent', *San Francisco Gate*, 4 August, https://www.sfgate.com/bayarea/article/Slow-Streets-San-Francisco-permanent-Sanchez-16362886.php#:~: text=The%20San%20Francisco%20Municipal%20Transportation,will%20permanently%20remain%20pedestrian%20friendly, last accessed 20 April 2022

Gran, C., J. A. and S. L. Ramos De Robles (2019) 'Climate change and flood risk: vulnerability assessment in an urban poor community in Mexico', *Environment and Urbanization* **31**(1): 75-92

Grasham, C. F., M. Korzenevica and K. J. Charles (2019) 'On considering climate resilience in urban water security: A review of the vulnerability of the urban poor in sub-Saharan Africa', *Wiley Interdisciplinary Reviews: Water* **6**(3): e1344

Graute, U. (2016) 'Local authorities acting globally for sustainable development', *Regional Studies* **50**(11): 1931-1942

Greater London Authority (2017) 'London Atmospheric Emissions Inventory (LAEI)', London Datastore, April, https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory-2013, last accessed 11 May 2022

Greater London Authority (2021) 'The mayor's ultra-low emissions zone for London', https://www.london.gov.uk/what-we-do/environment/pollution-and-air-quality/mayors-ultra-low-emission-zone-london, last accessed 11 May 2022

Griffiths, F., J. A. Watkins, C. Huxley, B. Harris, J. Cave, S. Pemba, B. Chipwaza, R. Lilford, M. Ajisola, T. N. Arvanitis and P. Bakibinga (2020) 'Mobile consulting (mConsulting) and its potential for providing access to quality healthcare for populations living in low-resource settings of low-and middle-income countries', *Digital Health* **6**: 2055207620919594

Gronkiewicz-Waltz, H., Larsson, A., Lisa Boni, A.L., Krogh Andersen, K., Ferrao, P., Forest, E., Jordan, R., Lenz, B., Lumbreras, J., Nicolaides, C., Reiter, J., Russ, M., Sulling, A., Termont, D., Vassilakou, M. (2020) *Proposed Mission: 100 Climate-Neutral Cities by 2030 – by and for the Citizens*, Report of the Mission Board for Climate-Neutral and Smart Cities, Directorate-General for Research and Innovation Clean Planet, European Commission, Brussels and Luxembourg, https://op.europa.eu/en/publication-detail/-/publication/bc7e46c2-fed6-11ea-b44f-01aa75ed71a1/language-en/format-PDF/source-160480388, last accessed 19 March 2022

Grover, A., S. V. Lall and W. F. Maloney (2022) *Place, Productivity, and Prosperity Revisiting Spatially Targeted Policies for Regional Development*, World Bank, Washington, DC

Gruebner, O., M. A. Rapp, M. Adli, U. Kluge, S. Galea and A. Heinz (2017) 'Cities and mental health' *Deutsches Ärzteblatt International* **114**(8): 121–127

Gruehn, D. (2017) 'Regional planning and projects in the Ruhr region, Germany', in M. Yokohari, A. Murakami, Y. Hara and K. Tsuchiya (eds) *Sustainable Landscape Planning in Selected Urban Regions*, Science for Sustainable Societies, Springer, Japan, pp. 215–225

Grunwald, A. (2011) 'Responsible innovation: Bringing together technology assessment, applied ethics, and STS research', *Enterprise and Work Innovation Studies* **7**: 9-31

Guglielmin, M., C. Muntaner, P. O'Campo and K. Shankardass (2018) 'A scoping review of the implementation of health in all policies at the local level', *Health Policy* **122**(3): 284-292

Guillermoprieto, A. (2019) 'This city bans cars every Sunday—and people love it', *National Geographic*, 27 March, https://www.nationalgeographic.com/environment/article/bogota-colombia-ciclovia-bans-cars-on-roads-each-sunday, last accessed 22 May 2022

Guo, H. D. and C. Chen (2021) 'Forecasting revenue impacts from COVID-19: The case of Florida municipalities', *State and Local Government Review* **53**(1): 78-88

Gupta, A. K., S. Wajih and N. Mani (2017) *Vulnerabilities of Urban Poor Children and Urban/Peri-urban Ecosystem Based Resilience*, Thematic Paper, Gorakhpur Environmental Action Group and UNICEF, India

Gutberlet, J., J. Kain, B. Nyakinya, M. Oloko, P. Zapata and M. J. Zapata Campos (2017) 'Bridging weak links of solid waste management in informal settlements', *The Journal of Environment & Development* **26**(1): 106-131

Guterres, A. and P. Spiegel (2012) 'The state of the world's refugees: Adapting health responses to urban environments', *JAMA* **308**(7): 673-674

Guzman, L. A. and J. P. Bocarejo (2017) 'Urban form and spatial urban equity in Bogota, Colombia', *Transportation Research Procedia* **25**: 4491-4506

Ha, B. T. T., L. Ngoc Quang, P. Quoc Thanh, D. M. Duc, T. Mirzoev and T. M. A. Bui (2021) 'Community engagement in the prevention and control of COVID-19: Insights from Vietnam', *PloS one* **16**(9)

Haaland, C. and C. K. van Den Bosch (2015) 'Challenges and strategies for urban green-space planning in cities undergoing densification: A review', *Urban Forestry & Urban Greening* **14**(4): 760-771

Haandrikman, K., R. Costa, B. Malmberg, A. F. Rogne and B. Sleutjes (2021) 'Socioeconomic segregation in European cities. A comparative study of Brussels, Copenhagen, Amsterdam, Oslo and Stockholm', *Urban Geography*, https://doi.org/10.1080/02723638.2021.1959778, last accessed 7 June 2022

Haase, D. (2021) 'Integrating ecosystem services, green infrastructure and nature-based solutions – new perspectives in sustainable land management: Combining knowledge about urban nature for action', in T. Weith, T. Barkmann, N. Gaasch, S. Rogga, C. Straub, and J. Zscheischler, J. (eds) *Sustainable Land Management in a European Context. Human-Environment Interactions*, vol 8, pp. 305-318, Springer, Switzerland, https://doi.org/10.1007/978-3-030-50841-8_16, last accessed 19 March 2022

Habert, G., M. Röck, K. Steininger, A. Lupísek, H. Birgisdottir, H. Desing, C. Chandrakumar, F. Pittau, A. Passer, R. Rovers, K. Slavkovic, A. Hollberg, E. Hoxha, T. Jusselme, E. Nault, K. Allacker and T. Lützkendorf, (2020) 'Carbon budgets for buildings: Harmonising temporal, spatial and sectoral dimensions', *Buildings and Cities* **1**(Suppl 1): 429-452

HACT (2020) *Do the Smart Thing: The Future of the Social Smart Home*, White Paper Series, Housing Associations' Charitable Trust, London

Hadjiosif, S. (2020) 'How to design a sustainable city', *Medium*, 7 December, https://medium.com/climate-conscious/how-to-design-a-sustainable-city-367b481d2039, last accessed 6 May 2022

Hajdarowicz, I. (2018) 'Does participation empower? The example of women involved in participatory budgeting in Medellin', *Journal of Urban Affairs* **44**(1): 22-37

Hall, T. and S. Vidén (2005) 'The million homes programme: A review of the great Swedish planning project', *Planning Perspectives* **20**(3): 301–328

Hambleton, R. (2015) 'Power, place and the New Civic Leadership', *Local Economy* **30**(2):167-172

Hamidi, S., S. Sabouri and R. Ewing (2020) 'Does density aggravate the COVID-19 pandemic?', *Journal of the American Planning Association* **86**(4): 495–509

Hao, H., D. Hui and D. Lau (2020) 'Material advancement in technological development for the 5G wireless communications', *Nanotechnology Reviews* **9**(1): 683-699

Harada, Y., T. H. Whitlow, P. H. Templer, R. W. Howarth, M. T. Walter, N. L. Bassuk and J. Russell-Anelli (2018) 'Nitrogen biogeochemistry of an urban rooftop farm', *Frontiers in Ecology and Evolution* **6**: 153

Harman, B. P., B. M. Taylor and M. B. Lane (2015) 'Urban partnerships and climate adaptation: Challenges and opportunities', *Current Opinion in Environmental Sustainability* **12**: 74-79

Harris, E. (2018) 'Remarks at the high-level conversation on economic resilience and sustaining peace: Learning from lessons of countries', United Nations Department of Economic and Social Affairs', https://www.un.org/en/desa/remarks-high-level-conversation-economic-resilience-and-sustaining-peace-learning, last accessed 28 April 2022

Harris, S. (2020) 'Post lockdown London: Parking spaces and traffic lanes to vanish to encourage walking and cycling', *ITV News*, 6 May, https://www.itv.com/news/london/2020-05-06/post-lockdown-london-parking-spaces-and-traffic-lanes-to-vanish-to-encourage-walking-and-cycling, last accessed 6 June 2022

Harrison, J. and H. Gu (2021) 'Planning megaregional futures: Spatial imaginaries and megaregion formation in China', *Regional Studies* **55**:77-89

Harrouk, C. (2020) 'Perkins and Will creates guideline for a safe return to the office during COVID-19', *ArchDaily*, 20 May, https://www.archdaily.com/939928/perkins-and-will-creates-guideline-for-a-safe-return-to-the-office-during-covid-19, last accessed 20 April 2022

Hartmann, H. and P. Thiery (2022) *Global Findings BTI 2022*, Gütersloh: Bertelsmann Stiftung

Harvey, C. A., M. R. Martínez-Rodríguez, J. M. Cárdenas, J. Avelino, B. Rapidel, R. Vignola, C. I. Donatti and S. Vilchez-Mendoza (2017) 'The use of ccosystem-based adaptation practices by smallholder farmers in Central America', *Agriculture, Ecosystems & Environment* **246**: 279-290

Hassan, A. M. and H. Lee (2015) 'The paradox of the sustainable city: Definitions and examples', *Environment, development and sustainability* **17**(6): 1267-1285

Hausfather, Z. (2021) 'Explainer: Will global warming "stop" as soon as net-zero emissions are reached?', *CarbonBrief,* 29 April, https://www.carbonbrief.org/explainer-will-global-warming-stop-as-soon-as-net-zero-emissions-are-reached, last accessed 19 March 2022

Hausknost, D., W. Haas, S. Hielscher, M. Schäfer, M. Leitner, I. Kunze and S. Mandl (2018) 'Investigating patterns of local climate governance: How low-carbon municipalities and intentional communities intervene in social practices', *Environmental Policy and Governance* **28**(6): 371-382

He, C., Z. Liu, J. Wu, X. Pan, Z. Fang, J. Li and B. A. Bryan (2021) 'Future global urban water scarcity and potential solutions', *Nature Communications* **12**

He, G., I. Boas, A. P. J. Mol and Y. Lu (2017) 'E-participation for environmental sustainability in transitional urban China', *Sustainability Science* **12**(2): 187-202

Healey, P. (1997) *Collaborative Planning: Shaping Places in Fragmented Societies*, Macmillan International Higher Education, London

Hedberg, A., S. Šipka and J. Bjerkem (2019) *Creating a Digital Roadmap for a Circular Economy*, European Policy Centre, Belgium

Heilakka, R. (2020) 'How upskilling could help cities rebuild after Coronavirus', https://www.weforum.org/agenda/2020/11/how-upskilling-could-help-cities-rebuild-after-coronavirus, last accessed 8 November 2021

Heineke, K., A. Ménard, F. Södergren and M. Wrulich. (2019) 'Development in the mobility technology ecosystem – how can 5G help?' McKinsey & Company, https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/development-in-the-mobility-technology-ecosystem-how-can-5g-help, last accessed 19 March 2022

Hemström, K., D. Simon, H. Palmer, B. Perry and M. Polk (2021) *Transdisciplinary Knowledge Co-production: A Guide for Sustainable Cities*, Practical Action Publishing, United Kingdom

Henderson, J. V. (2000) *The Effects of Urban Concentration on Economic Growth,* Working Paper 7503, National Bureau of Economic Research, Cambridge, https://doi.org/10.3386/w7503, last accessed 6 April 2022

Henderson, J. V. and S. Kriticos (2018) 'The development of the African system of cities', *Annual Review of Economics* **10**: 287-314

Henderson, V. and D. Nigmatulina (2016) 'The fabric of African cities: How to think about density and land use', Unpublished paper, *London School of Economics*

Henrique, K. P. and P. Tschakert (2020) 'Pathways to urban transformation: From dispossession to climate justice', *Progress in Human Geography* **45**(5): 1169-1191

Henson, R. M., A. Ortigoza, K. Martinez-Folgar, F. Baeza, W. Caiaffa, A. V. Vergara, A. V. D. Roux and G. Lovasi (2020) 'Evaluating the health effects of place-based slum upgrading physical environment interventions: A systematic review (2012–2018)', *Social Science & Medicine* **261:**113102

Hepburn, C., B. O'Callaghan, N. Stern, J. Stiglitz, and D. Zenghelis (2020) 'Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change?', *Oxford Review of Economic Policy* **36**(Supp 1): S359–S381

Herbert, B. (2021) 'Satisfying lodging or illegal hotels? Analyzing the legal issues of AirBnB', *University*

of Cincinnati Law Review, 7 July, https://uclawreview.org/2021/07/07/satisfying-lodging-or-illegal-hotels-analyzing-the-legal-issues-of-airbnb/, last accessed 8 November 2021

Higham, J., S. A. Cohen, C. T. Cavaliere, A. Reis and W. Finkler (2016) 'Climate change, tourist air travel and radical emissions reduction', *Journal of Cleaner Production* **111**: 336-347

Hillgren, P. A. (2013) 'Participatory design for social and public innovation: Living Labs as spaces for agonistic experiments and friendly hacking', in Manzini, E., Staszowksi, E. (Eds) *Public and collaborative: Exploring the intersection of design, social innovation and public policy*, pp. 75-88

Hilpert, Y. M. (2021) 'Glowing cities and the future of manufacturing in the US and Europe: How digitalization will impact metropolitan areas depending on sectoral dominances and regional skill distribution', *European Planning Studies* **29**(9): 1672-1689

Hinkle, H., M. McGinley, T. Hargett and S. Dascher (2019) *Carbon Farming with Timber Bamboo: A Superior Sequestration System Compared to Wood*, BamCore, United States, https://bamcore.com/wp-content/uploads/2019/01/Carbon-Farming-with-Timber-Bamboo.pdf, last accessed 19 March 2022

Hlahla, S. and T. R. Hill (2018) 'Responses to climate variability in urban poor communities in Pietermaritzburg, KwaZulu-Natal, South Africa', *Sage Open* **8**(3): 2158244018800914

Hodder, A. (2020) 'New technology, work and employment in the era of COVID-19: Reflecting on legacies of research', *New Technology, Work and Employment* **35**(3): 262-275

Hoffmann, S., U. Feldmann, P. M. Bach, C. Binz, M. Farrelly, N. Frantzeskaki, H. Hiessl, J. Inauen, T. A. Larsen, J. Lienert, J. Londong, C. Lüthi, M. Maurer, C. Mitchell, E. Morgenroth, K. L. Nelson, L. Scholten, B. Truffer and K. M. Udert (2020) 'A research agenda for the future of urban water management: Exploring the potential of nongrid, small-grid, and hybrid solutions', *Environmental Science & Technology* **54**(9): 5312-5322

Hofman, P. S., B. E. Elzen and F. W. Geels (2004) 'Sociotechnical scenarios as a new policy tool to explore system innovations: Co-evolution of technology and society in the Netherland's electricity domain', *Innovation* **6**(2): 344-360

Hogan, V. K., E. M. de Araujo, K. L. Caldwell, S. N. Gonzalez-Nahm and K. Z. Black (2018) '"We black women have to kill a lion everyday": An intersectional analysis of racism and social determinants of health in Brazil', *Social Science & Medicine* **199**: 96-105

Hollands, R. G. (2015) 'Critical interventions into the corporate smart city', *Cambridge Journal of Regions, Economy and Society* ***8***(1):61-77

Honey-Rosés, J., I. Anguelovski, V. K. Chireh, C. Daher, C. Konijnendijk van den Bosch, J. S. Litt, V. Mawani, M. K. McCall, A. Orellana, E. Oscilowicz, U. Sánchez, M. Senbel, X. Tan, E.Villagomez, O. Zapata and M. J. Nieuwenhuijsen (2020) 'The impact of COVID-19 on public space: An early review of the emerging questions – design, perceptions and inequities', *Cities and Health*, https://doi.org/10.1080/23748834.2020.1780074, last accessed 7 June 2022

Hoogeveen, J. G. and G. Lopez-Acevedo (2021) *Distributional Impacts of COVID-19 in the Middle East and North Africa Region,* MENA Development Report, World Bank, Washington, DC, https://doi: 10.1596/978-1-4648-1776-2, last accessed 3 May 2022

Hooli, L. J. (2016) 'Resilience of the poorest: Coping strategies and indigenous knowledge of living with the floods in Northern Namibia', *Regional Environmental Change* **16**(3): 695-707

Hörcher, D., R. Singh, and D. J. Graham, (2021) 'Social distancing in public transport: Mobilising new technologies for demand management under the Covid-19 crisis', *Transportation* **49**: 735–764

Hori, S. (2021) 'How blockchain can empower smart cities - and why interoperability will be crucial', World Economic Forum, https://www.weforum.org/agenda/2021/04/how-blockchain-can-empower-smart-cities-gtgs21/, last accessed 8 November 2021

Horn, P. (2021) 'Enabling participatory planning to be scaled in exclusionary urban political environments: Lessons from the Mukuru Special Planning Area in Nairobi', *Environment and Urbanization* **33**(2): 519-538

Horn, P., J. Kimani, J. Makau and P. Njoroge (2020) 'Scaling participation in informal settlement upgrading: A documentation of community mobilisation and consultation processes in the Mukuru Special Planning Area', Nairobi, Kenya, Working Paper, Global Development Institute, University of Manchester

Howard, S. D., K. L. Lee, A. G. Nathan, H. C. Wenger, M. H. Chin and S. C. Cook (2019) 'Healthcare experiences of transgender people of color', *General Internal Medicine* **34**(10): 2068–2074

Hsu, A., J. Brandt, O. Widerberg, S. Chan and A. Weinfurter (2020) 'Exploring links between national climate strategies and non-state and sub-national climate action in nationally determined contributions (NDCs)', *Climate Policy* **20**(4): 443-457

Hsu, A., N. Höhne, T. Kuramochi, M. Roelfsema, A. Weinfurter, Y. Xie, K. Lütkehermöller, S. Chan, J. Corfee-Morlot, P. Drost, P. Faria, A. Gardiner, D. J. Gordon, T. Hale, N. E. Hultman, J. Moorhead, S. Reuvers, J. Setzer, N. Singh, C. Weber and O. Widerberg (2019) 'A research roadmap for quantifying non-state and subnational climate mitigation action', *Nature Climate Change* **9**(1): 11-17

Hu, Y., W. Barbour, S. Samaranayake and D. Work (2020) 'The rebound: How Covid-19 could lead to worse traffic (V2)', https://lab-work.github.io/therebound/, last accessed 29 January 2022

Hughes, B. B., T. Hanna, K. McNeil, D. K Bohl and J. D. Moyer (2021) *Pursuing the Sustainable Development Goals in a World Reshaped by COVID-19*, Frederick S. Pardee Center for International Futures and United Nations Development Programme, Denver and New York

Hughes, C. (2018) *Fair Shot: Rethinking Inequality and How We Earn*, St. Martin's Press, New York

Hughes, N. and N. Strachan (2010) 'Methodological review of UK and international low carbon scenarios', *Energy Policy* **38**(10): 6056-6065

Hulme, M. (2011) 'Meet the humanities', *Nature Climate Change* **1**(4): 177-179

Huning, S. (2020) 'From feminist critique to gender mainstreaming—and back? The case of German urban planning', *Gender, Place & Culture* **27**(7): 944-964

Huxley, R., A. Owen and P. Chatterton (2019) 'The role of regime-level processes in closing the gap between sustainable city visions and action', *Environmental Innovation and Societal Transitions* **33**: 115-126

ICLEI (2018) *Multilevel Climate Action: The Path to 1.5 degrees*, Local Governments for Sustainability, Germany

ICLEI, Cities Network, Cities Alliance and GIZ (2018) *Guide on Connecting Green Recovery and Resilience in Cities, Resilient Cities Action Package 2021(ReCAP21),* Local Governments for Sustainability, Germany, https://www.citiesalliance.org/sites/default/files/2022-02/ReCAP21_Guide.pdf, last accessed 3 May 2022

ICRC (International Committee of the Red Cross) (2017) 'War in cities: What is at stake?', https://www.icrc.org/en/document/war-cities-what-stake-0, last accessed 3 May 2022

IEA (International Energy Agency)(2014) *Net Zero Energy Solar Buildings*, International Energy Agency, Paris

IEA (2021a) *World Energy Outlook 2021,* World Energy Outlook, International Energy Agency, Paris

IEA (2021b) *Net Zero by 2050: A Roadmap for the Global Energy Sector*, International Energy Agency, Paris, https://www.iea.org/reports/net-zero-by-2050, last accessed 19 March 2022

IEA (2021c) *Greenhouse Gas Emissions from Energy: Overview*, International Energy Agency, Paris https://www.iea.org/reports/greenhouse-gas-emissions-from-energy-overview, last accessed 19 March 2022

IEA (2021d) *Tracking Transport 2021,* International Energy Agency, Paris, https://www.iea.org/reports/tracking-transport-2021, last accessed 19 March 2022

IEA (2021e) *Global Energy Review 2021:* Assessing the Effects of Economic Recoveries on Global Energy Demand and CO2 Emissions in, Global Energy Review, International Energy Agency, Paris

IEA (2021f) *World Energy Outlook 2021: Executive Summary*, World Energy Outlook, International Energy Agency, Paris

IEA (2022) *A 10-Point Plan to Cut Oil Use*, International Energy Agency, France

IIED (International Institute for Environment and Development)(2016) *Informality and Inclusive Green Growth: Evidence from 'The Biggest Private Sector' Event*, International Institute for Environment and Development, London, https://pubs.iied.org/sites/default/files/pdfs/migrate/17365IIED.pdf, last accessed 13 May 2022

IISD (International Institute for Sustainable Development)(1996) 'Summary report, 3–14 June 1996 Habitat II', https://enb.iisd.org/events/habitat-ii/summary-report-3-14-june-1996, last accessed 13 February 2022

Ijjasz-Vasquez, E. and M. Mukim, (2021) 'Doubling down on city competitiveness for COVID-19 recovery', https://www.brookings.edu/blog/future-development/2021/03/16/doubling-down-on-city-competitiveness-for-covid-19-recovery/, last accessed 3 May 2022

ILO (International Labour Organization) (2015) 'R204 - transition from the informal to the formal economy recommendation, 2015 (No. 204)' https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:R204, last accessed 24 May 2022

ILO (2018) *Women and Men in the Informal Economy: A Statistical Picture (Third Edition)*, International Labour Organization, Geneva

ILO (2019) *Work for a Brighter Future: Global Commission on the Future of Work*, International Labour Organization, Geneva

ILO (2020a) *Crisis and the Informal Economy Immediate Responses and Policy Challenges*, https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---travail/documents/briefingnote/wcms_743623.pdf, last accessed 3 May 2022

ILO (2020b) *Impact of Lockdown Measures on the Informal Economy: A Summary*, https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---travail/documents/briefingnote/wcms_743534.pdf, last accessed 5 May 2022

ILO (2021a) *World Social Protection Report 2020-22: Social Protection at the Crossroads - in Pursuit of a Better Future*, International Labour Organization, Geneva

ILO (2021b) *ILO Monitor: COVID-19 and the World of Work (Seventh Edition)*, https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/briefingnote/wcms_767028.pdf, last accessed 5 May 2022

ILO (2022) *World Employment and Social Outlook: Trends 22*, International Labour Office, Geneva

IMD (2021) *Smart City Index,* Institute for Management Development, Switzerland

IMF (International Monetary Fund) (2017) 'Chart of the week: The potential for growth and Africa's informal economy', *IMF Blog,* 8 August, https://blogs.imf.org/2017/08/08/chart-of-the-week-the-potential-for-growth-and-africas-informal-economy, last accessed 2 March 2022

IMF (2021) *World Economic Outlook: Recovery During a Pandemic – Health Concerns, Supply*

Disruptions, Price Pressures, International Monetary Fund, Washington, DC
Imrie, R. (2000) 'Disability and discourses of mobility and movement', *Environment and Planning A*, **32**(9): 1641-1656
Independent Panel for Pandemic Preparedness and Response (2021) *COVID-19: Make it the Last Pandemic,* https://theindependentpanel.org/mainreport/, last accessed 24 March 2022
Infiniti Research Limited (2021) *Global Blockchain Technology Market 2021-2025*, Infiniti Research Limited, India, https://www.reportlinker.com/p04793539/Global-Blockchain-Technology-Market.html?utm_source=GNW, last accessed 8 November 2021
Institute for Health Metrics and Evaluation (2022) 'Data Visualization', *Healthdata*, https://www.healthdata.org/results/data-visualizations, last accessed 2 May 2022
International Bank for Reconstruction and Development and The World Bank (2019) *Innovative Finance Solutions For Climate-Smart Infrastructure New Perspectives On Results-Based Blended Finance For Cities*, Washington, https://www.gprba.org/sites/gpoba/files/publication/downloads/2019-07/new-perspectives-results-based-blended-finance-cities-innovative-finance.pdf, last accessed 27 May 2022
IOM (2019) *World Migration Report 2020,* International Organization for Migration, Geneva, https://publications.iom.int/system/files/pdf/wmr_2020.pdf, last accessed 25 April 2022
IPBES (2019) *Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Germany, https://doi.org/10.5281/zenodo.3831673, last accessed 19 March 2022
IPCC (Intergovernmental Panel on Climate Change) (2014a) *Climate Change 2014: Mitigation of Climate Change.* Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge
IPCC (2014b) *Summary for Policymakers in Climate Change 2014 Mitigation of Climate Change*, Cambridge University Press, Cambridge
IPCC (2018) *Global Warming of 1.5°C*, IPCC Special Report, Intergovenmental Panel on Climate Change, Geneva, https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf, last accessed 19 March 2022
IPCC (2019) *Summary for Policymakers in Special Report on the Ocean and Cryosphere in a Changing Climate*, Cambridge University Press, Cambridge, https://www.ipcc.ch/site/assets/uploads/sites/3/2022/03/01_SROCC_SPM_FINAL.pdf, last accessed 6 May 2022
IPCC (2021) *Climate Change 2021: The Physical Science Basis,* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge
IPCC (2022a) *Climate Change 2022: Mitigation of Climate Change.* Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge https://www.ipcc.ch/report/ar6/wg2/, last accesssed 13 May 2022
IPCC (2022b) *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*, Cambridge University Press, Cambridge (UK) and New York
Irazábal, C. and C. Huerta (2016) 'Intersectionality and planning at the margins: LGBTQ youth of color in New York', *Gender, Place & Culture* **23**(5): 714-732
Irazábal, C. and P. Jirón (2020) 'Latin American smart cities: Between worlding infatuation and crawling provincialising', *Urban Studies* **58**(3): 507-534
IRENA (International Renewable Energy Agency) (2020) *Rise of Renewables in Cities: Energy Solutions for the Urban Future*, International Renewable Energy Agency, Abu Dhabi
IRP (International Resource Panel) (2017) *Green Technology Choices: The Environmental and Resource Implications of Low-Carbon Technologies*, International Resource Panel and United Nations Environment Programme, Nairobi
IRRC (International Review of the Red Cross) (2022) 'The impact of attacks on urban services II: Reverberating effects of damage to water and wastewater systems on infectious disease', January 2022, https://international-review.icrc.org/articles/impact-of-attacks-on-urban-services-ii-damage-to-wastewater-systems-infectious-disease-915#footnote43_h8syz25, last accessed 4 May 2022
Işıldar, A., E.D. van Hullebusch, M. Lenz, G. Du Laing, A. Marra, A. Cesaro, S. Panda, A. Akcil, M.A. Kucuker and K. Kuchta (2019) 'Biotechnological strategies for the recovery of valuable and critical raw materials from waste electrical and electronic equipment (WEEE) – a review', *Journal of Hazardous Materials* **362**: 467-481
Ismail, W. A. W. and I. Said (2015) 'Integrating the community in urban design and planning of public spaces: a review in Malaysian cities', *Procedia-Social and Behavioral Sciences* **168**: 357-364
ITU (International Telecommunication Union) (2018) *Measuring the Information Society Report (Volume 1)*, International Telecommunication Union Publications, Geneva
Jacobson, M. Z. (2020) *100% Clean, Renewable Energy and Storage for Everything*, First Edition, Cambridge University Press, England
Jaimes Torres, M., M. Aguilera Portillo, T. Cuerdo-Vilches, I. Oteiza, and M. Á. Navas-Martín (2021) 'Habitability, resilience, and satisfaction in Mexican homes to COVID-19 pandemic', *International Journal of Environmental Research and Public Health* **18**(13): 6993
Jakimowicz, K. (2021) 'How local authorities and communities are working on better connectivity to bridge the digital divide', *Data-Smart City Solutions*, 21 June, https://datasmart.ash.harvard.edu/news/article/how-local-authorities-and-communities-are-working-better-connectivity-bridge-digital, last accessed 27 September 2021
Janke, T. and M. Sentina (2018) *Indigenous knowledge: Issues for protection and management*, IP Australia, Commonwealth of Australia
Jarzebski, M. P., T. Elmqvist, A. Gasparatos, K. Fukushi, S. Eckersten, D. Haase, J. Goodness, S. Khoshkar, O. Saito, K. Takeuchi, T. Theorell, N. Dong, F. Kasuga, R. Watanabe, G. B. Sioen, M. Yokohari and J. Pu (2021)'Ageing and population shrinking: Implications for sustainability in the urban century', *npj Urban Sustainability* **1**(1): 1-11, https://doi.org/10.1038/s42949-021-00023-z, last accessed 21 April 2022
Jaskiewicz, T., I. Mulder, N. Morelli and J. S. Pedersen (2020) 'Hacking the hackathon format to empower citizens in outsmarting "smart" cities', *Interaction Design and Architecture(s) Journal* **43**: 8-29
Jiang, H., S. Geertman and P. Witte (2020) 'Smart urban governance: An alternative to technocratic "smartness"', *GeoJournal* **87**: 1639–1655
Jiang, L. and B. C. O'Neill (2017) 'Global urbanization projections for the shared socioeconomic pathways', *Global Environmental Change* **42**: 193-199, https://doi.org/10.1016/j.gloenvcha.2015.03.008, last accessed 6 April 2022
Jiang, L., B. Jones, D. Balk and B. C. O'Neill (2021) 'The importance of reclassification to understanding urban growth: a demographic decomposition of the United States, 1990-2010', *Population, Space and Place*: e2562, https://doi.org/10.1002/psp.2562, last accessed 6 April 2022
John, B., L. W. Keeler, A. Wiek and D. J. Lang (2015) 'How much sustainability substance is in urban visions?–An analysis of visioning projects in urban planning', *Cities* **48**: 86-98
Johnson, S. A. (2017) 'The cost of war on public health: An exploratory method for understanding the impact of conflict on public health in Sri Lanka', *PLoS One* **12**(1): e0166674
Joint Research Centre (2019) *The Future of Cities – Opportunities, Challenges and the Way Forward*, Publications Office, Luxembourg, https://publications.jrc.ec.europa.eu/repository/bitstream/JRC116711/the-future-of-cities_online.pdf, last accessed 6 May 2022
Jones, B., D. Balk and S. Leyk (2020) 'Urban change in the United States, 1990–2010: A spatial assessment of administrative reclassification', *Sustainability* **12**(4): 1649, https://doi.org/10.3390/su12041649, last accessed 6 April 2022
Jongman, B. (2018) 'Effective adaptation to rising flood risk', *Nature Communications* **9**: 1986
Joshi, A., B. Malhotra, C. Amadi, M. Loomba, A. Misra, S. Sharma, A. Arora and J. Amatya (2020) 'Gender and the digital divide across urban slums of New Delhi, India: Cross-sectional study', *Journal of Medical Internet Research* **22**(6): e14714
Joss, S., F. Sengers, D. Schraven, F. Caprotti and Y. Dayot (2019) 'The smart city as global discourse: storylines and critical junctures across 27 cities', *Journal of Urban Technology* **26**(1): 3-34
Kabeer, N., S. Razavi and Y. van der Meulen Rodgers (2021) 'Feminist economic perspectives on the COVID-19 pandemic', *Feminist Economics* **27**(1-2): 1-29
Kabisch, N., N. Frantzeskaki, S. Pauleit, S. Naumann, M. Davis, M. Artmann, D. Haase, S. Knapp, H. Korn, J. Stadler, K. Zaunberger and A. Bonn (2016) 'Nature-based solutions to climate change mitigation and adaptation in urban areas: Perspectives on indicators, knowledge gaps, barriers, and opportunities for action', *Ecology and Society* **21**(2)
Kahila-Tani, M., A. Broberg, M. Kyttä and T. Tyger (2016) 'Let the citizens map—public participation GIS as a planning support system in the Helsinki master plan process', *Planning Practice & Research* **31**(2): 195-214
Kakderi, C., N. Komninos, A. Panori and E. Oikonomaki (2021) 'Next city: learning from cities during COVID-19 to tackle climate change', *Sustainability* **13**(6): 3158
Kamara, A. B., N. Meriggi and W. Prichard (2020) 'Freetown just implemented a new property tax system that could quintuple revenue', https://www.ictd.ac/blog/freetown-new-property-tax-system-quintuple-revenue, last accessed 3 May 2022
Kang, M., Y. Choi, J. Kim, K. O. Lee, S. Lee, I. K. Park, J. Park and I. Seo (2020) 'COVID-19 impact on city and region: What's next after lockdown?', *International Journal of Urban Sciences* **24**(3): 297–315
Kantor, S. and A. Whalley (2014) 'Knowledge spillovers from research universities: Evidence from endowment value shocks', *Review of Economics and Statistics* **96**(1): 171-188
Karadimas, D., A. Papalambrou, J. Gialelis and S. Koubias (2016) 'An integrated node for smart-city applications based on active RFID tags; use case on waste-bins', *IEEE 21st International Conference on Emerging Technologies and Factory Automation* 1-7
Karppinen, K. and O. Puukko (2020) 'Four discourses of digital rights: Promises and problems of rights-based politics', *Journal of Information Policy* **10**(1): 304-328
Karunathilake, H., K. Hewage, T. Prabatha, R. Ruparathna and R. Sadiq (2020) 'Project deployment strategies for community renewable energy: A dynamic multi-period planning approach', *Renewable Energy* **152**: 237-258
Karunathilake, H., P. Perera, R. Ruparathna, K. Hewage and R. Sadiq (2018) 'Renewable energy integration into community energy systems: A case study of new urban residential development', *Journal of Cleaner Production* **173**: 292-307
Karvonen, A., F. Cugurullo and F. Caprotti (eds) (2019) *Inside Smart Cities: Place, Politics and*

Urban Innovation, First Edition, Routledge, Oxfordshire

Kayanan, C. M., N. Moore-Cherry and A. Clavin (2021) 'Cities under lockdown: Public health and urban vulnerabilities and neighbourhood planning in Dublin', in B. Doucet, R. Filion, and R. van Melik (eds) *Global Reflections on COVID 19 and Urban Inequalities: Housing and Home. Volume 2,* Bristol University Press, England, pp: 189-198

Kaza, S., L. C. Yao, P. Bhada-Tata and F. Wan Woerden (2018) *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*, World Bank, Washington, DC, https://documents1.worldbank.org/curated/en/697271544470229584/pdf/What-a-Waste-2-0-A-Global-Snapshot-of-Solid-Waste-Management-to-2050.pdf, last accessed 8 November 2021

Keskinen, P., H. Winschiers-Theophilus, S. Chivuno-Kuria, A. Müller and M. Nieminen (2021) 'Digital microwork as a livelihood strategy in a Namibian informal settlement', *The Electronic Journal of Information Systems in Developing Countries* **88**(1): e12197

Khalifa, M. A. (2015) 'Evolution of informal settlements upgrading strategies in Egypt: From negligence to participatory development', *Ain Shams Engineering Journal* **6**(4): 1151-1159

Khan, A. (2020) 'Cities of missed opportunities: Improving the lives of people in poverty', https://odi.org/en/insights/cities-of-missed-opportunities-improving-the-lives-of-people-in-poverty, last accessed 7 June 2022

Khan, J. (2013) 'What role for network governance in urban low carbon transitions?', *Journal of Cleaner Production* **50**: 133-139

Khavarian-Garmsir, A. R., A. Sharifi and N. Moradpour (2021) 'Are high-density districts more vulnerable to the COVID-19 pandemic?', *Sustainable Cities and Society* **70**: 102911

Kher, J., S. Aggarwal and G. Punhani (2015) 'Vulnerability of poor urban women to climate-linked water insecurities at the household level: A case study of slums in Delhi', *Indian Journal of Gender Studies* **22**(1): 15-40

Khomenko, S., M. Cirach, E. Pereira-Barboza, N. Mueller, J. Barrera-Gómez, D. Rojas-Rueda, K. de Hoogh, G. Hoekand and M. Nieuwenhuijsen (2021) 'Premature mortality due to air pollution in European cities: A health impact assessment', *The Lancet Planetary Health* **5**(3): e121-e134

Kidokoro, T., H. Hsiao and R. Fukuda (2021) 'Study on the polarization to megacity regions and the urban divide: Focusing on the case of Nishinari Ward, Osaka City, Japan', *Japan Architectural Review* **4**(1): 117-128

Kimari, W. (2016) *We Do Not Want Nny More Masters': Ruins, Planning and the" Messy Labours" of the Urban Poor, HAL, France*

King, R., M. Orloff, T. Virsilas and T. Pande (2017) *Confronting the Urban Housing Crisis in the Global South: Adequate, Secure, and Affordable Housing*, World Resources Report Working Paper 2, World Resources Institute, Washington, DC, https://files.wri.org/d8/s3fs-public/towards-more-equal-city-confronting-urban-housing-crisis-global-south.pdf, last accessed 4 May 2022

Kinyanjui, M. N. (2014) *Women and the Informal Economy in Urban Africa: From the Margins to The Centre*, Zed Books Ltd, London

Kiran, A. H., N. Oudshoorn and P. Verbeek (2015) 'Beyond checklists: Toward an ethical-constructive technology assessment', *Journal of Responsible Innovation* **2**(1): 5-19

Kishimoto, S. and O. Petitjean (2017) 'Introduction: The Untold Story', in Dumontier, M., and Doherty, A. (eds), *Reclaiming Public Services: How Cities and Citizens are Turning Back Privatization*, Transnational Institute, Amsterdam, pp. 11-23

Kitchin, R. and M. Dodge (2019) 'The (in)security of smart cities: Vulnerabilities, risks, mitigation, and prevention', *Journal of Urban Technology* **26**(2): 47-65

Kitchin, R., C. Coletta, L. Evans, L. Heaphy and D. M. Donncha (2017) *Smart Cities, Urban Technocrats, Epistemic Communities and Advocacy Coalitions,* The Programmable City Working Paper, No. 26, SocArXiv, Unites States

Kiunsi, R. (2013) 'The constraints on climate change adaptation in a city with a large development deficit: The case of Dar es Salaam', *Environment and Urbanization* **25**(2): 321-337

Kivoi, D. L. (2014) 'Factors impeding political participation and representation of women in Kenya', *Humanities and Social Sciences* **2**(6): 173-181

Kjellstrom, T., M. Lodh, T. McMichael, G. Ranmuthugala, R. Shrestha and S. Kingsland (2006) 'Air and water pollution: Burden and strategies for control', in D. T. Jamison, J. G. Breman, A. R. Measham, G. Alleyne, M. Claeson, D. B. Evans, P. Jha, A. Mills and P. Musgrove (eds) *Disease Control Priorities in Developing Countries*, Second Edition, World Bank and Oxford University Press, Washington, DC

Kjellstrom, T., S. Friel, J. Dixon, C. Corvalan, E. Rehfuess, D. Campbell-Lendrum, F. Gore and J. Bartram (2007) 'Urban environmental health hazards and health equity', *Journal of Urban Health* **84**(1): 86-97

Klenert, D., F. Funke, L. Mattauch and B. O'Callaghan (2020) 'Five lessons from COVID-19 for advancing climate change mitigation', *Environmental and Resource Economics* **76**(4): 751–778

Klinsky, S. and A. Mavrogianni (2020) 'Climate justice and the built environment', *Buildings and Cities* **1**(1): 412-428

Knuth, S. and A. Krishnan (2021) *Climate Finance for Cities and Urban Governments*, The British Academy, London, https://doi.org/10.5871/bacop26/9780856726743.001, last accessed 3 May 2022

Köhler, J., F. W. Geels, F. Kern, J. Markard, E. Onsongo, A. Wieczorek, F. Alkemade, F. Avelino, A. Bergek, F. Boons, L. Fünfschilling, D. Hess, G. Holtz, S. Hyysalo, K. Jenkins, P. Kivimaa, M. Martiskainen, A. McMeekin, M. S. Mühlemeier, B. Nykvist, B. Pel, R. Raven, H. Rohracher, B. Sandén, J. Schot, B. Sovacool, B. Turnheim, D. Welch, and P. Wells (2019) 'An agenda for sustainability transitions research: State of the art and future directions', *Environmental Innovation and Societal Transitions* **31**: 1-32

Kola, L., B. A. Kohrt, C. Hanlon, J. A. Naslund, S. Sikander, M. Balaji, C. Benjet, E. Y. L. Cheung, J. Eaton, P. Gonsalves, M. Hailemariam, N. P. Luitel, D. B. Machado, E. Misganaw, O. Omigbodun, T. Roberts, T. T. Salisbury, R. Shidhaye, C. Sunkel, V. Ugo, A. J. van Rensburg, O. Gureje, S. Pathare, S. Saxena, G. Thornicroft, and V. Patel (2021) 'COVID-19 mental health impact and responses in low-income and middle-income countries: Reimagining global mental health', *The Lancet Psychiatry* **8**(6): 535-550

Kosovac A., K. Hartley, M. Acuto and D. Gunning (2020) *Conducting City Diplomacy a Survey of International Engagement in 47 Cities,* Chicago Council of Global Affairs, https://www.thechicagocouncil.org/sites/default/files/2020-12/ccga_citydiplomacy_2020_0.pdf...../// , last accessed 25 February 2022

Kothari, B. (2002) 'Theoretical streams in marginalized peoples' knowledge(s): Systems, asystems, and subaltern knowledge(s)', *Agriculture and Human Values* **19**(3): 225-237

Krishnan, S. and L. P. Ganesan (2021) 'Chapter 1 - smart cities with blockchain technology: A comprehensive survey', in S. Krishnan, V. E. Balas, E. G. Julie, Y. H. Robinson and R. Kumar (eds) *Blockchain for Smart Cities*, Elsevier, Netherlands, pp. 1-15

Kroeker-Falconi, C. and R. C. Kettle (2021) *Compendium of Best Practices for Housing in Africa,* Build Solid Ground: Habitat for Humanity International, Europe, Middle East and Africa, Habitat for Humanity, Africa, https://www.habitat.org/sites/default/files/documents/compendium_best_cases_Africa.pdf, last accessed 4 May 2022

Krupnick, M. (2020) 'How America's shrinking cities can 'rightsize', *The Guardian*, 13 February, https://www.theguardian.com/us-news/2020/feb/13/us-shrinking-cities-rightsize, last accessed 3 May 2022

Kubanza, N. S. and D. Simatele (2016) 'Social and environmental injustices in solid waste management in sub-Saharan Africa: A study of Kinshasa, the Democratic Republic of Congo', *Local Environment* **21**(7): 866-882

Kulenovic, Z. J. (2015) 'Competitive cities: Bucaramanga, Colombia – An Andean achiever', *World Bank Blogs*, 6 November, https://blogs.worldbank.org/psd/competitive-cities-bucaramanga-colombia-andean-achiever, last accessed 3 May 2022

Kulenovic, Z. J. and J. T. Zhu (2016) 'Competitive cities: Changsha, China – coordination, competition, construction, and cars', *World Bank Blogs*, 23 February, https://blogs.worldbank.org/psd/competitive-cities-changsha-china-coordination-competition-construction-and-cars, last accessed 3 May 2022

Kumar, A., S. Zimmerman and F. Arroyo-Arroyo (2021) *Myths and Realities of "Informal" Public Transport in Developing Countries: Approaches for Improving the Sector,* Sub-Saharan African Transport Policy Program, Washington, DC

Kumar, V. S., K. S. Aggour, P. Cuddihy and J. W. Weisenberg (2020) 'A federated, multimodal digital thread platform for enabling digital twins', *Naval Engineers Journal* **132**(1): 47-56

Kunzmann, K. R. (2020) 'Smart cities after Covid-19: Ten narratives', *The Planning Review* **56**(2): 20-31

Kurochkin, A. and S. Morozova (2020) 'Cities in the new media reality: Between freedom of creativity and digital control', *CEUR Workshop Proceedings* **2813:** 318-326

Kwami, J. (2015) 'Gender, entrepreneurship, and informal markets in Africa: Understanding how Ghanaian women traders self-organize with digital tools', in J. Ofori-Dankwa and K. B. Omane-Antwi (eds) *Comparative Case Studies on Entrepreneurship in Developed and Developing Countries*, IGI Global, Pennsylvania, pp. 19-49

La Greca, P., F. Martinico and F. C. Nigrelli (2020) '"Passata è la tempesta..." A land-use planning vision for the Italian Mezzogiorno in the post pandemic', *Journal of Land Use Mobility and Environment* 213–230

Lacelle-Webster, A. and M. E. Warren (2021) 'Citizens' sssemblies and democracy', *Oxford Research Encyclopedia of Politics,* 25 March, https://doi.org/10.1093/acrefore/9780190228637.013.1975, last accessed 19 March 2022

Lafortezza, R., J. Chen, C. K. van den Bosch and T. B. Randrup (2018) 'Nature-based solutions for resilient landscapes and cities', *Environmental Research* **165**: 431-441

Lai, S., F. Leone and C. Zoppi (2020) 'COVID-19 and spatial planning: A few issues concerning public policy', *Journal of Land Use Mobility and Environment* 231–246

Lak, A., A. Sharifi, S. Badr, A. Zali, A. Maher, E. Mostafavi and D. Khalili (2021) 'Spatio-temporal patterns of the COVID-19 pandemic, and place-based influential factors at the neighborhood scale in Tehran', *Sustainable Cities and Society* **72**: 103034

Lakatos, E. S., G. Yong, A. Szilagyi, D. S. Clinci, L. Georgescu, C. Iticescu and L. Cioca (2021) 'Conceptualizing core aspects on circular economy in cities', *Sustainability* **13**(14): 7549

Lakner C., D. G. Mahler, M. Negre and E. P. Prydz (2020) *How Much Does Reducing Inequality Matter for Global Poverty?,* Global Poverty Monitoring Technical Note 13, World Bank Group, Washington, DC, https://openknowledge.worldbank.org/bitstream/handle/10986/33902/How-Much-Does-Reducing-Inequality-Matter-for-

Global-Poverty.pdf?sequence=1&isAllowed=y, last accessed 4 May 2022
Lall, S. and S. Wahba (2020) 'No urban myth: Building inclusive and sustainable cities in the pandemic recovery', World Bank, https://www.worldbank.org/en/news/immersive-story/2020/06/18/no-urban-myth-building-inclusive-and-sustainable-cities-in-the-pandemic-recovery, last accessed 4 May 2022
Lall, S. V., J. V. Henderson and A. J. Venables (2017) *Africa's Cities: Opening Doors to the World*, World Bank, Washington, DC.
Lampert, T., J. Costa, O. Santos, J. Sousa, T. Ribeiro and E. Freire (2021) 'Evidence on the contribution of community gardens to promote physical and mental health and well-being of non-institutionalized individuals: A systematic review', *PloS One* **16**(8): e0255621
Lampis, A., J. M. Mott Pavanelli, A. L. D. V. Guerrero and C. Bermann (2021) 'Possibilidades e limites da transição energética: Uma análise à luz da ciência pós-normal', *Estudos Avançados* **35**(103): 183-200
Langergraber, G., B. Pucher, L. Simperler, J. Kisser, E. Katsou, D. Buehler, M. C. G. Mateo and N. Atanasiva (2020) 'Implementing nature-based solutions for creating a resourceful circular city', *Blue Green Systems* **2**(1): 173-185
Lanza, G. G. and M. De Martino (2022) 'Urban housing inequity: Housing deprivation and social response in the City of Naples' *Sustainability* **14**(3): 1047
Lasage, R., S. Muis, C. S. E. Sardella, M. A. Van Drunen, P. H. Verburg and J. C. J. H. Aerts (2015) 'A stepwise, participatory approach to design and implement community based adaptation to drought in the Peruvian Andes', *Sustainability* **7**(2): 1742-1773
Lassa, J. (2019) 'When Does Institutionalization Mean NGOnization? Sustaining Climate Risk Governance in Secondary Cities', Resilience Development Initiative, Charles Darwin University, Australia, https://rdi.or.id/storage/files/publication/89.pdf, last accessed 25 February 2022
Leck, H. and D. Roberts (2015) 'What lies beneath: Understanding the invisible aspects of municipal climate change governance', *Current Opinion in Environmental Sustainability* **13**: 61-67
Leck, H. and D. Simon (2018) 'Local authority responses to climate change in South Africa: the challenges of transboundary governance', *Sustainability* **10**(7): 2542
Lee, J. (2013) 'Can You Hear Me Now?: Making Participatory Governance Work for the Poor', *Harvard Law. and Policy Review* **7**(2):405-441
Leung, D. Y. C., G. Caramanna and M. M. Maroto-Valer (2014) 'An overview of current status of carbon dioxide capture and storage technologies', *Renewable and Sustainable Energy Reviews* **39**: 426-443
LSE Cities, UN-Habitat, United Cities and Local Governments (2016) *How cities are governed: Building a global database for current models of urban governance*, https://urbangovernance.net, last accessed 16 February 2022
Levy, C. (2013) 'Travel choice reframed: "deep distribution" and gender in urban transport, *Environment and Urbanization*, **25**(1): 47-63
Lewis, S. (2021) 'The climate crisis can't be solved by carbon accounting tricks', *The Guardian*, 3 March, https://www.theguardian.com/commentisfree/2021/mar/03/climate-crisis-carbon-accounting-tricks-big-finance, last accessed 19 March 2022
Li, J. and N. Rose (2017) 'Urban social exclusion and mental health of China's rural-urban migrants–a review and call for research', *Health & Place* **48**: 20-30
Li, J., D. Webster, J. Cai and L. Muller (2019) 'Innovation clusters revisited: On dimensions of agglomeration, institution, and built-environment', *Sustainability* **11**(12): 3338
Liimatainen, H., M. Pöllänen and R. Viri (2018) 'CO2 reduction costs and benefits in transport: Socio-technical scenarios', *European Journal of Futures Research* **6**(1): 1-12
Lilford, R. J., O. Oyebode, D. Satterthwaite, G. J. Melendez-Torres, Y. Chen, B. Mberu, S. I. Watson, J. Sartori, R. Ndugwa, W. Caiaffa, T. Haregu, A. Capon, R. Saith and A. Ezeh (2017) 'Improving the health and welfare of people who live in slums', *The Lancet* **389**(10068): 559-570
Lin, J. (2018) *Governing Climate Change: Global Cities and Transnational Lawmaking*, Cambridge University Press, Cambridge
Lincoln Institute of Land Policy (2016) *The Atlas of Urban Expansion*, Lincoln Institute of Land Policy, Cambridge, www.lincolninst.edu/sites/default/files/pubfiles/atlas-of-urban-expansion-2016-volume-1-full.pdf, last accessed 6 April 2022
Lindley, S., S. Pauleit, K. Yeshitela, S. Cilliers. and C. Shackleton (2018) 'Rethinking urban green infrastructure and ecosystem services from the perspective of sub-Saharan African cities', *Landscape and Urban Planning* **180:** 328-338
Ling, F. (2017) 'Microbial communities as biosensors for monitoring urban environments', *Microbial Biotechnology* **10**(5): 1149-1151
LinkedIn (2022) *2022 Global Talent Trends: The Reinvention of Company Culture,* LinkedIn Corporation, https://business.linkedin.com/content/dam/me/business/en-us/talent-solutions-lodestone/body/pdf/global_talent_trends_2022.pdf, last accessed 30 April 2022
Liquete, C., A. Udias, G. Conte, B. Grizzetti and F. Masi (2016) 'Integrated valuation of a nature-based solution for water pollution control. Highlighting hidden benefits', *Ecosystem Services* **22**: 392-401
Liu, D., R. Huang and M. Wosinski (2017) *Smart Learning in Smart Cities*, First Edition, Springer, Singapore
Lixiong, Y. (2018) *The Social Assistance Reform in China: Towards a Fair and Inclusive Social Safety Net*, United Nations Department of Economic and Social Affairs, https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2018/06/The-Social-Assistance-Reform-in-China.pdf, last accessed 4 May 2022
Local Government Association (2021) *A Vision for Urban Growth and Recovery*, Local Government Association, London
Loewe, M., T. Zintl and A. Houdret (2021) 'The social contract as a tool of analysis: introduction to the special issue on "framing the evolution of new social contracts in Middle Eastern and North African countries"', *World Development* **145**: 104982
Löffler, G. (2016) *Analysis of the State of Local Finance in Intermediary Cities*, United Cities and Local Governments (UCLG), Barcelona
Loh, T. H., C. Coes and B. Buthe (2020) 'Separate and unequal: Persistent residential segregation is sustaining racial and economic injustice in the U.S.', https://www.brookings.edu/essay/trend-1-separate-and-unequal-neighborhoods-are-sustaining-racial-and-economic-injustice-in-the-us, last accessed 4 May 2022
Lohmann, L. (2001) 'Democracy or carbocracy? climate trading and the future of the climate debate', Corner House Briefing 24, http://www.thecornerhouse.org.uk/resource/democracy-or-carbocracy, last accessed 6 June 2022
Lohmann, L. (2008) 'Carbon trading, climate justice and the production of ignorance: Ten examples', *Development* **51**(3): 359-365
Long, J. and J. L. Rice (2019) 'From sustainable urbanism to climate urbanism', *Urban Studies* **56**(5): 992-1008
Lord, B (2020) 'Inequality in America: Far beyond extreme. The maldistribution of America's income and wealth has reached levels that our conventional economic stats have trouble revealing', https://inequality.org/great-divide/inequality-in-america-far-beyond-extreme, last accessed 4 May 2022
Lovasi, G. S., A. V. D. Roux and J. Kolker (eds) (2020) *Urban Public Health: A Research Toolkit for Practice and Impact*, First Edition, Oxford University Press, New York
Łowicki, D. and S. Piotrowska (2015) 'Monetary valuation of road noise. Residential property prices as an indicator of the acoustic climate quality', *Ecological Indicators* **52**: 472-479
Ludwick, T., A. Morgan, S. Kane, M. Kelaherand and B. McPake (2020) 'The distinctive roles of urban community health workers in low-and middle-income countries: A scoping review of the literature', *Health Policy and Planning* **35**(8): 1039-1052
Luederitz, C., E. Brink, F. Gralla, V. Hermelingmeier, M. Meyer, L. Niven, L. Panzer, S. Partelow, A. Rau, R. Sasaki, D.J. Abson, D. J. Lang, C. Wamsler and H. von Wehrden (2015) 'A review of urban ecosystem services: Six key challenges for future research', *Ecosystem Services* **14**: 98-112
Lund, F., L. Alfers and V. Santana (2016) 'Towards an inclusive occupational health and safety for informal workers' *New Solutions: A Journal of Environmental and Occupational Health Policy* **26**(2): 190-207
Lund, S., A. Madgavkar, J. Manyika, S. Smit, K. Ellingrud, M. Meaney and O. Robinson (2021) *The Future of Work After COVID19: Executive Summary*, McKinsey Global Institute, https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19, last accessed 6 June 2022
Lustig, N., V. M. Pabon, F. Sanz and S. D. Younger (2020) *The Impact of COVID-19 Lockdowns and Expanded Social Assistance on Inequality, Poverty and Mobility in Argentina, Brazil, Colombia and Mexico,* CGD Working Paper 556, Center for Global Development, Washington, DC, https://www.cgdev.org/sites/default/files/impact-covid-19-lockdowns-and-expanded-social-assistance.pdf, last accessed 6 May 2022
Lutz, W., A. Goujon, K. C. Samir, M. Stonawski and N. Stilianakis (2018) *Demographic and Human Capital Scenarios for the 21st Century: 2018 Assessment for 201 Countries*, Jo Publications Office of the European Union, Luxembourg
Lynch, L. R. R. (2021) 'Harambee urban farms fill crucial void for Black, Latinx families during the pandemic', *Milwaukee Journal Sentinel,* 22 October, https://www.jsonline.com/story/news/2021/10/22/urban-farms-become-vital-food-option-milwaukee-during-pandemic/8458800002/, last accessed 22 April 2022
Lyons, G. and C. Davidson (2016) 'Guidance for transport planning and policymaking in the face of an uncertain future', *Transportation Research Part A: Policy and Practice* **88**: 104-116
Maantay, J. (2007) 'Asthma and air pollution in the Bronx: Methodological and data considerations in using GIS for environmental justice and health research', *Health & Place* **13**(1): 32-56
Mack E. A. and S. Wrase (2017) 'A burgeoning crisis? A nationwide assessment of the geography of water affordability in the United States', *PLoS ONE* **12**(4): e0176645
Madsen, H. M., R. Brown, M. Elle and P. S. Mikkelsen (2017) 'Social construction of stormwater control measures in Melbourne and Copenhagen: A discourse analysis of technological change, embedded meanings and potential mainstreaming', *Technological Forecasting and Social Change* **115**: 198-209
Magallón-Botaya, R., B. Oliván-Blázquez, K. L. Ramírez-Cervantes, F. Méndez-López-de-la-Manzanara, I., Aguilar-Palacio, M. Casajuana-Closas and E. Andrés-Esteban (2021) 'Geographic factors associated with poorer outcomes in patients diagnosed with COVID-19 in primary health care', *International Journal of Environmental Research and Public Health* **18**(7): 3842
Mahendra, A., R. King, J. Du, A. Dasgupta, V. A. Beard, A. Kallergis and K. Schalch (2021) *Towards a More Equal City: Seven Transformations for More Equitable and Sustainable Cities*,

World Resources Report, World Resources Institute, Washington, DC

Majale, M. (2008) 'Employment creation through participatory urban planning and slum upgrading: The case of Kitale, Kenya', *Habitat International* **32**(2): 270-282

Makondo, C. C. and D. S. G. Thomas (2018) 'Climate change adaptation: Linking indigenous knowledge with western science for effective adaptation', *Environmental Science and Policy* **88**: 83-91

Maley, J. (2019) 'How many people in your suburb live in poverty?', *The Sydney Morning Herald,* 24 October, https://www.smh.com.au/national/nsw/we-are-surrounded-by-poverty-sydney-s-pockets-of-disadvantage-revealed-20191022-p5338n.html, last accessed 4 May 2022

Malinga, R., L. J. Gordon, R. Lindborg and G. Jewitt (2013) 'Using participatory scenario planning to identify ecosystem services in changing landscapes', *Ecology and Society* **18**(4)

Mangi, M. Y., Z. Yue, S. Kalwar and Z. A. Lashari (2020) 'Comparative analysis of urban development trends of Beijing and Karachi metropolitan areas', *Sustainability* **12**(2): 451

Manoharan, A. P., A. Ingrams, D. Kang and H. Zhao (2021) 'Globalization and worldwide best practices in e-government', *International Journal of Public Administration* **44**(6): 465-476

Manzini, E. and E. Staszowksi (2013) 'Introduction' in *Public And Collaborative: Exploring The Intersection Of Design, Social Innovation And Public Policy,* DESIS network, pp. i-vi

Marcotullio, P. J., A. Sarzynski, J. Sperling, A. Chávez, H. Estiri, M. Pathak, R. Zimmerman, J. Garnick, C. Kennedy, E. J. Linky and C. Nahon (2018) 'Energy transformation in cities', in C. Rosenzweig, W. D. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal, and S. A. Ibrahim (eds) *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Cambridge University Press, Cambridge, pp. 443-490

Marique, A. and S. Reiter (2014) 'A simplified framework to assess the feasibility of zero-energy at the neighbourhood/community scale', *Energy and Buildings* **82**: 114-122

Marique, A., M. Penders and S. Reiter (2013) 'From zero-energy building to zero-energy neighbourhood: Urban form and mobility matter', *Proceedings PLEA 2013 - 29th Conference, Sustainable Architecture for a Renewable Future,* 10-12 September, Munich, Germany, https://mediatum.ub.tum.de/doc/1169297/1169297.pdf, last accessed 6 June 2022

Markard, J. (2018) 'The next phase of the energy transition and its implications for research and policy', *Nature Energy* **3**(8): 628-633

Marteau, T. M., N. Chater and E. E. Garnett (2021) 'Changing behaviour for net zero 2050', *BMJ* **375**, https://doi.org/10.1136/bmj.n2293, last accessed 19 March 2022

Martin, C. J., J. Evans and A. Karvonen (2018) 'Smart and sustainable? five tensions in the visions and practices of the smart-sustainable city in Europe and North America', *Technological Forecasting and Social Change* **133**: 269-278

Martínez, L. and J. R. Short (2021) 'The pandemic city: Urban issues in the time of COVID-19', *Sustainability* **13**(6): 3295

Martinez-Fernandez, C. and C. Wu (2009) 'Shrinking cities: A global overview and concerns about Australian mining cities cases' in K. Pallagst, J. Aber, I. Audirac, E. Cunningham-Sabot, S. Fol, C. Martinez-Fernandez, S. Moraes, H. Mulligan, J. Vargas-Hernandez, T. Wiechmann, T. Wu and J. Rich (eds) *Shrinking Cities: Problems, Patterns and Strategies of Urban Transformation in a Global Context*, Monograph 2009-01, University of California, Berkeley, CA

Martinez-Fernandez, C., T. Weyman, S. Fol, I. Audirac, E. Cunningham-Sabot, T. Wiechmann, and H. Yahagi (2016) 'Shrinking cities in Australia, Japan, Europe and the USA: from a global process to local policy responses', *Progress in Planning* **105**: 1-48

Martinez-Vazquez, J., and V. Vulovic (2017) 'How well do subnational borrowing regulations work?', In Y. Naoyuki and J. Peter (eds) *Central and local government relations in Asia*, Edward Elgar Publishing, pp. 161–220

MASS Design Group (2020) *The Role of Architecture in Fighting COVID-19: Spatial Strategies for Restaurants in Response to COVID-19*, https://massdesigngroup.org/sites/default/files/multiple-file/2020-05/Spatial%20Strategies%20for%20Restaurants%20in%20Response%20to%20COVID-19_.pdf, last accessed 1 May 2022

Matatiele, P. and M. Gulumian (2016) 'A cautionary approach in transitioning to 'green' energy technologies and practices is required', *Reviews on Environmental Health* **31**(2): 211-223

Matzopoulos, R., K. Bloch, S. Lloyd, C. Berens, B. Bowman, J. Myers and M. L. Thompson (2020) 'Urban upgrading and levels of interpersonal violence in Cape Town, South Africa: The violence prevention through urban upgrading programme' *Social Science & Medicine*, **255**: 112978

Mayors Migration Council (2021) 'Global Mayors Action Agenda On Climate And Migration', https://www.mayorsmigrationcouncil.org/c40-mmc-action-agenda, last accessed 6 March 2022

Mberu, B., M. Wamukoya, S. Oti and C. Kyobutungi (2015) 'Trends in causes of adult deaths among the urban poor: Evidence from Nairobi urban health and demographic surveillance system, 2003–2012' *Journal of Urban Health* **92**(3): 422-445

McArthur, J., E. Robin and E. Smeds (2019) 'Socio-spatial and temporal dimensions of transport equity for London's night time economy', *Transportation Research Part A: Policy and Practice* **121**: 433-443

McBain, S. and J. Teter (2021) *Tracking Transport,* International Energy Agency, Paris, https://www.iea.org/reports/tracking-transport-2021, last accessed 19 March 2022

McDonald, B. and S. Larson (2020) 'Implications of the coronavirus on sales tax revenue and local government fiscal health', *Journal of Public and Non-profit Affairs* **6** (3): 377–400

McDonald, D. (2018) 'Remunicipalization: The future of water services?' *Geoforum*, **91**:47-56

McDonald, R. I., K. Weber, J. Padowski, M. Flörke, C. Schneider, P. A. Green, T. Gleeson, S. Eckman, B. Lehner, D. Balk, T. Boucher, G. Grill and M. Montgomery (2014) 'Water on an urban planet: urbanization and the reach of urban water infrastructure', *Global environmental change* **27:** 96-105

McFarlane, C. (2020) 'De/re-densification', *City* **24**(1-2): 314-324

McGowan, H. E. (2020) 'The coronavirus is creating an inflection point in the future of work', *Forbes*, 16 April, https://www.forbes.com/sites/heathermcgowan/2020/04/16/the-coronavirus-is-creating-an-inflection-point-in-the-future-of-work/?sh=177b7f6c3b2d, last accessed 23 April 2022

McGranahan, G., D. Balk and B. Anderson (2007) 'The rising tide: Assessing the risks of climate change and human settlements in low elevation coastal zones. *Environment and Urbanization* **19**(1): 17-37, https://doi.org/10.1177/0956247807076960, last accessed 6 April 2022

McGregor, D., S. Whitaker and M. Sritharan (2020) 'Indigenous environmental justice and sustainability', *Current Opinion in Environmental Sustainability* **43**: 35-40

McGuirk, P., R. Dowling, S. Maalsen and T. Baker (2020) 'Urban Governance Innovation and COVID-19' *Geographical Research* **59**(2):188-195

McKinsey & Company (2020) 'From No Mobility to Future Mobility: Where COVID-19 has Accelerated Change', https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/from-no-mobility-to-future-mobility-where-covid-19-has-accelerated-change#, last accessed 19 March 2022

McKinsey Global Institute (2016) *Bridging Global Infrastructure Gaps*, https://www.mckinsey.com/~/media/mckinsey/business%20functions/operations/our%20insights/bridging%20global%20infrastructure%20gaps/bridging-global-infrastructure-gaps-full-report-june-2016.pdf, last accessed 18 May 2022

McMillan R., J. Kocsis and A. Daniere (2021) 'Rights, justice and climate resilience: Lessons from fieldwork in urban Southeast Asia', *Environment and Urbanization* **34**(1): 170-189

McNee, G., and D. Pojani (2021) 'NIMBYism as a barrier to housing and social mix in San Francisco', *Journal of Housing and the Built Environment* **37**:553–573

McPhearson, T., M. Karki, C. Herzog, H. S. Fink, L. Abbadie, P. Kremer, C. M. Clark, M. I. Palmer, K. Perini and M. Dubbeling (2018) 'Urban ecosystems and biodiversity', in C. Rosenzweig, W. D. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal, and S. A. Ibrahim (eds) *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*, Cambridge University Press, Cambridge, pp. 257-318

Meehan, K., J. R. Jurjevich, N. M. J. W. Chun and J. Sherrill (2020) 'Geographies of insecure water access and the housing–water nexus in US cities', *Proceedings of the National Academy of Sciences* **117**(46): 28700-28707

Melica, G., P. Bertoldi, A. Kona, A. Iancu, S. Rivas and P. Zancanella (2018) 'Multilevel governance of sustainable energy policies: The role of regions and provinces to support the participation of small local authorities in the Covenant of Mayors', *Sustainable Cities and Society* **39**: 729-739

Menashe-Oren, A. and G. Stecklov (2017) *Population Age Structure and Sex Composition in Sub-Saharan Africa: A Rural-urban Perspective*, IFAD Research Series 17*,* International Fund for Agricultural Development, Rome, https://www.ifad.org/documents/38714170/39135332/17_Research_Age_Sex_web.pdf/34ebef51-79f5-4361-bd0e-cf139d6fafad, last accessed 7 April 2022

Menashe€Oren, A. and P. Bocquier (2021) 'Urbanization is no longer driven by migration in low€ and middle€ncome Countries (1985–2015)', *Population and Development Review* **47**(3): 639-663, https://doi.org/10.1111/padr.12407, last accessed 6 April 2022

Mendes Barbosa, L. and G. Walker (2020) 'Epistemic injustice, risk mapping and climatic events: Analysing epistemic resistance in the context of favela removal in Rio de Janeiro', *Geographica Helvetica* **75**(4): 381-391

Meth, P., T. Goodfellow, A. Todes and S. Charlton (2021) 'Conceptualizing African urban peripheries', *International Journal of Urban and Regional Research* **45**(6): 985-1007

Meyer, N. and C. Auriacombe (2019) 'Good Urban Governance and City Resilience: An Afrocentric Approach to Sustainable Development', *Sustainability* **11**(19):5514

Michael, K., T. Deshpande and G. Ziervogel (2019) 'Examining vulnerability in a dynamic urban setting: The case of Bangalore's interstate migrant waste pickers', *Climate and Development* **11**(8): 667-678

Mira-Bonnardel, S., F. Antonialli and D. Attias (eds) (2021) *The Robomobility Revolution of Urban Public Transport: A Social Sciences Perspective*, First Edition, Springer, Switzerland

Mitchell, B. C. and J. Chakraborty (2014) 'Urban heat and climate justice: A landscape of thermal inequity in Pinellas County, Florida', *Geographical Review* **104**(4): 459-480

Mitlin, D. and S. Bartlett (2018) 'Editorial: Co-production–key ideas', *Environment & Urbanization* **30**(2): 355-366

Mitlin, D., V. A. Beard, D. Satterthwaite and J. Du

(2019) *Unaffordable and Undrinkable: Rethinking Urban Water Access in the Global South*, World Resources Report: Towards a More Equal City Working Paper 6, World Resources Institute, Washington, DC

Mo Ibrahim Foundation (2020) *2020 Ibrahim Index of African Governance: Index Report,* https://mo.ibrahim.foundation/iiag/downloads, last accessed 25 February 2022

Moberg, K. R., C. Aall, F. Dorner, E. Reimerson, J. Ceron, B. Sköld, B. K. Sovacool and V. Piana (2019) 'Mobility, food and housing: Responsibility, individual consumption and demand-side policies in European deep decarbonisation pathways', *Energy Efficiency* **12**(2): 497-519

Moglia, M., N. Frantzeskaki, P. Newton, M. Pineda-Pinto, J. Witheridge, S. Cook and S. Glackin (2021) 'Accelerating a green recovery of cities: Lessons from a scoping review and a proposal for mission-oriented recovery towards post-pandemic urban resilience', *Developments in the Built Environment* **7**: 100052

Mohindra, K. S. and T. Schrecker (2013) 'From bulldozing to housing rights: reducing vulnerability and improving health in African slums', *Global Health Promotion* **20**(1): 64-69

Moir, E., T. Moonen and G. Clark (2014) *The Future of Cities: What is the Global Agenda?,* The Business of Cities, London https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/429125/future-cities-global-agenda.pdf, last accessed 23 April 2022

Møller, M. S., A. S. Olafsson, K. Vierikko, K. Sehested, B. Elands, A. Buijs and C. K. van den Bosch (2019) 'Participation through place-based e-tools: A valuable resource for urban green infrastructure governance?', *Urban Forestry & Urban Greening* **40**: 245-253

Moloney, A (2020) 'How COVID-19 is exposing 'hidden poverty' across unequal cities', World Economic Forum, https://www.weforum.org/agenda/2020/11/pandemic-exposes-hidden-poverty-unequal-cities, last accessed 4 May 2022

Montgomery, M. R. (2008) 'The urban transformation of the developing world', *Science*, **319**(5864): 761-764, https://doi.org/10.1126/science.1153012, last accessed 6 April 2022

Moreno, C., Z. Allam, D. Chabaud, C. Gall and F. Pratlong (2021) 'Introducing the "15-minute city": Sustainability, resilience and place identity in future post-pandemic cities', *Smart Cities* **4**(1): 93–111

Morrison, J. (2020) 'Smart cities and digital ethics: A few thoughts', https://calvium.com/smart-cities-digital-ethics-thoughts, last accessed 11 October 2021

Mos, E. (2021) 'Platformization in the third sector', *City* **25**(3-4): 315-331

Moser, C. (2011) 'A conceptual and operational framework for pro-poor asset adaptation to urban climate change', in D. Hoomweg, M. Freire, M. J. Lee, P. Bhada-Tata. and B. Yuen (eds) *Cities and Climate Change: Responding to an Urgent Agenda,* World Bank, Washington, DC, pp. 225-253

Moser, C. O. N. and C. McIlwaine (2014) 'New frontiers in twenty-first century urban conflict and violence', *Environment and Urbanization* **26**(2): 331-344

Mosler, S. and P. Hobson (2021) 'Close-to-nature heuristic design principles for future urban green infrastructure', *Urban Planning* **6**(4): 67-79

Mudau, N., D. Mwaniki, L. Tsoeleng, M. Mashalane, D. Beguy and R. Ndugwa (2020) 'Assessment of SDG Indicator 11.3.1 and urban growth trends of major and small cities in South Africa', *Sustainability* **12**(17): 7063

Muggah, R and R. Florida (2020) 'Megacity slums are incubators of disease – but coronavirus response isn't helping the billion people who live in them', *The Conversation*, 14 May, https://theconversation.com/megacity-slums-are-incubators-of-disease-but-coronavirus-response-isnt-helping-the-billion-people-who-live-in-them-138092, last accessed 4 May 2022

Muggah, R. (2014) 'Deconstructing the fragile city: Exploring insecurity, violence and resilience', *Environment and Urbanization* **26**(2): 345-358

Muggah, R. (2018) 'Latin America's cities are ready to take off. But their infrastructure is failing them', World Economic Forum, https://www.weforum.org/agenda/2018/06/latin-america-cities-urbanization-infrastructure-failing-robert-muggah/, last accessed 4 May 2022

Mulyaningsih, T., R. Wahyunengseh and S. Hastjarjo (2020) 'Poverty and digital divide: A study in urban poor neighborhoods', *Jurnal Ilmu Sosial dan Ilmu Politik* **24**(2): 189-203

Murgante, B., G. Balletto, G. Borruso, G. L. Casas, P. Castiglia and M. Dettori (2020) 'Geographical analyses of COVID-19's spreading contagion in the challenge of global health risks: The role of urban and regional planning for risk containment', *Journal of Land Use Mobility and Environment*: 283–304

Mustafa, A., M. Bruwier, P. Archambeau, S. Erpicum, M. Pirotton, B. Dewals and J. Teller (2018) 'Effects of spatial planning on future flood risks in urban environments', *Journal of Environmental Management* **225**: 193-204

Mutibwa, D. H., A. Hess and T. Jackson (2020) 'Strokes of serendipity: Community co-curation and engagement with digital heritage', *Convergence* **26**(1): 157–177

Mutinda, M., B. Mwau, J. Makau and A. Sverdlik (2020) 'Policy briefing: Rethinking slum upgrading in light of Nairobi's poverty penalty (SDI Kenya)', https://www.muungano.net/publicationslibrary/2020/5/20/muungano-alliance-policy-briefing-rethinking-slum-upgrading-in-light-of-nairobis-poverty-penalty#_ftn3, last accessed 4 May 2022

Mutuku, B., L. Boerboom and A. Madureira (2019) 'The role of Planning Support Systems in national policy transfer and policy translation in secondary cities', *International Planning Studies* **24**(3-4):293-307

Naden, C. (2020) 'Smart cities to benefit from new international standards task force', https://www.iso.org/news/ref2567.html, last accessed 14 November 2021

Nagenborg, M. (2020) 'Urban robotics and responsible urban innovation', *Ethics and Information Technology* **22**(4): 345–355

Nasca, T. F., N. Changfoot and S. D. Hill (2019) 'Participatory planning in a low-income neighbourhood in Ontario, Canada: Building capacity and collaborative interactions for influence', *Community Development Journal* **54**(4): 622-642

Nassar, M. A., L. Luxford, P. Cole, G. Oatley and P. Koutsakis (2019) 'The current and future role of smart street furniture in smart cities', *IEEE Communications Magazine* **57**(6): 68-73

National Research Council (2003) *Cities Transformed: Demographic Change and Its Implications in the Developing World*, National Academies Press, Washington, DC, https://doi.org/10.17226/10693, last accessed 6 April 2022

Natural Capital Germany (2017) *Ecosystem Services in the City – Protecting Health and Enhancing Quality of Life,* Technical University of Berlin, Germany, https://www.ufz.de/export/data/global/190507_TEEB_De_Broschuere_KF_Bericht3_Stadt_engl_web.pdf, last accessed 19 March 2022

Naude, W. (2020) 'Entrepreneurial Recovery from COVID-19: Decentralization, Democratization, Demand, Distribution and Demography', IZA Institute of Labor Economics, https://docs.iza.org/dp13436.pdf, last accessed 25 February 2022

Ndung'u, N. (2020) 'COVID-19 crisis amplifies the urgency for economic diversification in Africa', *Africa Renewal*, 8 September, https://www.un.org/africarenewal/magazine/september-2020/covid-19-crisis-amplifies-urgency-economic-diversification-africa, last accessed 05 March 2022

Neagle, E. (2022) 'Sustainable business must be people-centered', World Resources Institute, https://www.wri.org/insights/sustainable-business-must-be-people-centered, last accessed 3 May 2022

Negri, S., C. Sager, S. Wahba and S. Lall (2015) *Competitive Cities for Jobs and Growth: What, Who, and How*, World Bank, Washington, DC

Nematchoua, M. K., A. M. Nishimwe and S. Reiter (2021) 'Towards nearly zero-energy residential neighbourhoods in the European Union: A case study', *Renewable and Sustainable Energy Reviews* **135**: 110198

Nesbitt, L., M. J. Meitner, S. R. J. Sheppard and C. Girling (2018) 'The dimensions of urban green equity: A framework for analysis', *Urban Forestry & Urban Greening* **34**: 240-248

Nesta (2018) 'Flying high: Shaping the future of drones in UK cities', https://www.nesta.org.uk/event/flying-high-shaping-future-drones-uk-cities/

Nesti, G. (2020) 'Defining and assessing the transformational nature of smart city governance: insights from four European cases', *International Review of Administrative Sciences* **86**(1): 20-37

Nettle, D., E. Johnson, M. Johnson and R. Saxe (2021) 'Why has the COVID-19 pandemic increased support for universal basic income?', *Humanities and Social Sciences Communications* **8** (1): 1-12

Nguyen, M. C, H, N. Yoshida, H. Wu and A. Narayan (2020) *Profiles of the New Poor Due to the COVID-19 Pandemic*, World Bank, Washington, DC, https://thedocs.worldbank.org/en/doc/767501596721696943-0090022020/original/ProfilesofthenewpoorduetotheCOVID-19pandemic.pdf, last accessed 4 May 2022

Niemi, M. K., S. Dan, J, Kalliokoski, K. Shahzad, S. R. Shakeel, R. Alagirisamy and I. Laurila (2021) *Talent Retention and the Development of Digital Skills: A Study of the Ecosystem-based Digitalisation Academy located in Vaasa, Finland*, Ministry of Economic Affairs and Employment, Helsinki, https://urn.fi/URN: ISBN: 978-952-327-840-0, last accessed 3 May 2022

Nieuwenhuijsen, M. J., H. Khreis, E. Verlinghieri, N. Mueller and D. Rojas-Rueda (2017) 'Participatory quantitative health impact assessment of urban and transport planning in cities: a review and research needs', *Environment International* **103**: 61-72

Nigudkar, S. (2021) '15-minute city concept designed by Carlos Moreno wins Obel award 2021', *Rethinking The Future*, 6 November 2021https://www.re-thinkingthefuture.com/architectural-news/a5804-15-minute-city-concept-designed-by-carlos-moreno-wins-obel-award-2021/, last accessed 20 April 2022

Nikolaidis, N. P., D. Kolokotsa and S. A. Banwart (2017) 'Nature-based solutions: Business', *Nature* **543**(7645): 315-315

Ni[illegible], M. R., D. L. Badiu, D. A. Onose, A. A. Gavrilidis, S. R. Gr€dinaru, I. I. N€stase and R. Lafortezza (2018) 'Using local knowledge and sustainable transport to promote a greener city: The case of Bucharest, Romania', *Environmental Research* **160**: 331-338

Noorloos, F. and M. Kloosterboer (2018) 'Africa's new cities: The contested future of urbanization', *Urban Studies* **55**(6):*1223-1241*

Norman, B. and W. Steffen (2018) 'Planning within planetary boundaries', in Norman, B. (ed) *Sustainable Pathways for our Cities and Regions: Planning within Planetary Boundaries,* 1st Edition, Routledge, United Kingdom, pp. 20-44

Noykhovich, E., S. Mookherji and A. Roess (2019) 'The risk of tuberculosis among populations living in slum settings: A systematic review and meta-analysis', *Journal of Urban Health* **96**(2): 262-275

NYC Mayors Office of the Chief Technology Officer (2020) *The New York City Internet Master Plan,* https://www1.nyc.gov/assets/cto/downloads/internet-master-plan/NYC_IMP_1.7.20_FINAL-2.pdf, last accessed 25 February 2022

Oborn, P. and J. Walters (2021) *Planning for Climate Change and Rapid Urbanization: Survey of the*

Built Environment Professions in the Commonwealth – Executive Summary', Commonwealth Association of Architects, Commonwealth Association of Planners, Commonwealth Association of Surveying and Land Economy and Commonwealth Engineers Council, United Kingdom, https://www.thecommonwealth.io/wp-content/uploads/2020/07/Executive-Summary-BE.pdf, last accessed 28 April 2022

O'Brien, K. (2016) 'Climate change adaptation and social transformation', in D. Richardson, N. Castree, M. F. Goodchild, A. Kobayashi, W. Lei and R. A. Marston (eds) *International Encyclopedia of Geography: People, the Earth, Environment and Technology,* John Wiley & Sons, United States

Obeng-Odoom, F. (2016) 'Urban Governance in Africa Today: Reframing Experiences and Lessons', *Growth and Change* **48**(1):4-21

Odone, A., D. Delmonte, T. Scognamiglio and C. Signorelli (2020) 'COVID-19 deaths in Lombardy, Italy: Data in context', *The Lancet Public Health* **5**(6): e310

OECD (Organisation for Economic Co-operation and Development) (2015a) *Ageing in Cities,* http://dx.doi.org/10.1787/9789264231160-en, last accessed 3 May 2022

OECD (2015b) *Making Cities Work for All. Data and Actions for Inclusive Growth*, https://read.oecd.org/10.1787/9789264263260-en?format=pdf, last accessed 4 May 2022

OECD (2016) *OECD Territorial Reviews: Japan 2016*, OECD Territorial Reviews, OECD Publishing, Paris

OECD (2018a) *Climate-resilient Infrastructure,* OECD Environment Policy Paper No. 14, OECD Publishing, Paris

OECD (2018b) *The Productivity-Inclusiveness Nexus*, OECD Publishing, Paris

OECD (2019a) *The Circular Economy in Cities and Regions,* OECD Publishing, Paris

OECD (2019b) *Decentralised Development Co-operation: Unlocking the Potential of Cities and Regions*, https://doi.org/10.1787/e9703003-en, last accessed 25 February 2022

OECD (2019c) *Enhancing Innovation Capacity in City Government*, OECD Publishing, Paris

OECD (2019d) *Making Decentralisation Work: A Handbook for Policy-Makers*, https://doi.org/10.1787/g2g9faa7-en*,* last accessed 25 February 2022

OECD (2019e) *Measuring Distance to the SDG Targets 2019: An Assessment of Where OECD Countries Stand*, https://doi.org/10.1787/a8caf3fa-en, last accessed 25 February 2022

OECD (2020a) *Building Back Better: A Sustainable, Resilient Recovery After COVID-19*, https://read.oecd-ilibrary.org/view/?ref=133_133639-s08q2ridhf&title=Building-back-better-_A-sustainable-resilient-recovery-after-Covid-19&_ga=2.60021037.1859826171.1621058256-1077390381.1612859062, last accessed 6 May 2022

OECD (2020b) *Improving Transport Planning for Accessible Cities,* https://doi.org/10.1787/fcb2eae0-en, last accessed 6 April 2022

OECD (2020c) 'What is the impact of the COVID-19 pandemic on immigrants and their children?', https://www.oecd.org/coronavirus/policy-responses/what-is-the-impact-of-the-covid-19-pandemic-on-immigrants-and-their-children-e7cbb7de/#section-d1e554, last accessed 13 April 2022

OECD (2020d) *Broad-based Innovation Policy for All Regions and Cities*, OECD Regional Development Studies, OECD Publishing, Paris

OECD (2020e) 'Recommendations for municipal COVID response' in *The Territorial Impact of COVID-19: Managing the Crisis Across Levels of Government*, https://read.oecd-ilibrary.org/view/?ref=128_128287-5agkkojaaaandtitle=The-territorial-impact-of-covid-19-managing-the-crisis-across-levels-of-government, last accessed 25 February 2022

OECD (2020f) *Smart Cities and Inclusive Growth: Building on the Outcomes of the 1st OECD Roundtable on Smart Cities and Inclusive Growth*, https://www.oecd.org/cfe/cities/OECD_Policy_Paper_Smart_Cities_and_Inclusive_Growth.pdf, last accessed 25 February 2022

OECD (2021a) 'Launch of the G20 platform on SDGs localisation and intermediary cities (G20 PLIC)', https://www.oecd.org/dev/g20-platform-on-sdgs-localisation-and-intermediary-cities-launch-event.htm, last accessed 25 April 2022

OECD (2021b) *The Multilevel Governance of the SDGs,* Chapter 4, https://www.oecd-ilibrary.org/sites/b453ded2-en/index.html?itemId=/content/component/b453ded2-en, last accessed 25 February 2022

OECD (undated) 'Resilient cities', https://www.oecd.org/regional/resilient-cities.htm, last accessed 19 March 2022

OECD and CERI (Centre for Educational Research and Innovation) (2017) *The Starterpack - Futures Thinking in Action*, https://www.oecd.org/education/school/38981492.pdf, last accessed 7 May 2022

OECD and European Commission (2020) *Cities in the World: A New Perspective on Urbanization*, https://read.oecd.org/10.1787/d0efcbda-en?format=pdf, last accessed 23 April 2022

OECD and ILO (2019) *Tackling Vulnerability in the Informal Economy*, Development Centre Studies, OECD Publishing, Paris, https://doi.org/10.1787/939b7bcd-en, last accessed 3 May 2022

OECD and UCLG (2019) *2019 Report of the World Observatory on Subnational Government Finance and Investment – Key Findings,* https://www.oecd.org/regional/observatory-on-subnational-government-finance-and-investment.htm, last accessed 25 February 2022

OECD, UN-HABITAT, and UNOPS (2021) *Global State of National Urban Policy 2021: Achieving Sustainable Development Goals and Delivering Climate Action*, https://doi.org/10.1787/96eee083-en, last accessed 25 February 2022

Ohnsorge, F. and S. Yu (2021) *The Long Shadow of Informality: Challenges and Policies*, World Bank, Washington, DC

Okraszewska, R., A. Romanowska, M. Wołek, J. Oskarbski, K. Birr and K. Jamroz (2018) 'Integration of a multilevel transport system model into sustainable urban mobility planning', *Sustainability* **10**(2): 479

Olajide, O. A., M. E. Agunbiade and H. B. Bishi (2018) 'The realities of Lagos urban development vision on livelihoods of the urban poor', *Journal of Urban Management* **7**(1): 21-31

Olazabal, M., E. Chu, V. C. Broto and J. Patterson (2021) 'Subaltern forms of knowledge are required to boost local adaptation', *One Earth* **4**(6): 828-838

Oliveira e Costa, S., J. Aaltonen and M. Rusanen (2018) 'Making the most of brownfield sites in the Baltic Sea Region: Baltic Urban Lab has identified new ways to improve planning processes through public-private-people partnerships–the 4P approach', Nordregio #6 Policy brief, https://www.diva-portal.org/smash/get/diva2:1254946/FULLTEXT01.pdf, last accessed 2 March 2022

Oliver, P. (2016) *Green Bonds for Cities: A Strategic Guide for City-level Policymakers in Developing Countries*, Climate Policy Initiative, https://climatepolicyinitiative.org/wp-content/uploads/2016/12/Green-Bonds-for-Cities-A-Strategic-Guide-for-City-level-Policymakers-in-Developing-Countries.pdf, last accessed 2 March 2022

Olsson, L., A. Jerneck, H. Thoren, J. Persson and D. O'Byrne (2015) 'Why resilience is unappealing to social science: Theoretical and empirical investigations of the scientific use of resilience', *Science Advances* **1**(4): e1400217

ONS (2021) *Coronavirus (COVID-19) Related Deaths by Occupation, England and Wales: Deaths Registered Between 9 March and 28 December 2020,* Office for National Statistics, United Kingdom, https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/bulletins/coronaviruscovid19relateddeathsbyoccupationenglandandwales/deathsregisteredbetween9marchand28december2020, last accessed 8 November 2021

Onyanta, A. (2016) 'Cities, municipal solid waste management, and climate change: Perspectives from the South', *Geography Compass* **10**(12): 499-513

Open Contracting Partnership (2022) 'Open Contracting Partnership', https://www.open-contracting.org, last accessed 8 May 2022

Open Data Charter (2022) 'ODC', http://www.opendatacharter.net, last accessed 8 May 2022

Open Government Partnership (2020) *OGP at Ten: Toward Democratic Renewal,* https://www.opengovpartnership.org/ogp-at-ten-toward-democratic-renewal, last accessed 25 February 2022

Open Government Partnership (2022) 'OGP local', https://www.opengovpartnership.org/ogp-local, last accessed 8 May 2022

Open North (2021) *Digital Data Partnerships: Building the Foundation for Collaborative Data Governance in the Public Interest*, https://assets.ctfassets.net/e4wa7sgik5wa/62KQJwk6iQe6W6AAyNx4jF/b51bc8f1d04bd78694bff59dc12d700a/Digital_Data_Partnerships_Summary-EN.pdf, last accessed 25 February 2022

Open North (2022) *Open Smart Communities in Practice: How Communities Across Canada are Reaching their Goals and Overcoming Challenges Using Data and Technology*, https://opennorth.ca/publications/2sfzzrop6sz7k5wpjars8p_en, last accessed 25 February 2022

Ortiz E., S. and B. Gutiérrez Valdivia (2015) 'Planning from below: Using feminist participatory methods to increase women's participation in urban planning', *Gender & Development* **23**(1): 113-126

Ortiz-Moya, F. (2020) 'Green growth strategies in a shrinking city: Tackling urban revitalization through environmental justice in Kitakyushu City, Japan', *Journal of Urban Affairs* **42**(3): 312-332, DOI: 10.1080/07352166.2018.1448225, last accessed 6 April 2022

Østby, G. (2016) 'Rural–urban migration, inequality and urban social disorder: Evidence from African and Asian cities', *Conflict Management and Peace Science* **33**(5): 491-515

Oteros-Rozas, E., B. Martín-López, T. M. Daw, E. L. Bohensky, J. R. A. Butler, R. Hill, J. Martin-Ortega, A. Quinlan, F. Ravera, I. Ruiz-Mallén, M. Thyresson, J. Mistry, I. Palomo, G. D. Peterson, T. Plieninger, K. A. Waylen, D. M. Beach, I. C. Bohnet, M. Hamann, J. Hanspach, K. Hubacek, S. Lavorel and S. P. Vilardy (2015) 'Participatory scenario planning in place-based social-ecological research: insights and experiences from 23 case studies', *Ecology and Society* **20**(4)

Otioma, C., A. M. Madureira and J. Martinez (2019) 'Spatial analysis of urban digital divide in Kigali, Rwanda', *GeoJournal* **84**(3): 719-741

Owen, R., J. Stilgoe, P. Macnaghten, M. Gorman, E. Fisher, D. Guston and J. Bessant (2013) 'A framework for responsible innovation', in R. Owen, J. R. Bessant and M. Heintz (eds) *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, Wiley, London, pp. 27–50

Oxfam International (2021) 'Brazil: Extreme inequality in numbers', https://www.oxfam.org/en/brazil-extreme-inequality-numbers, last accessed 27 April 2022

Pagano, M. A. and C. K. McFarland (2020) 'When will your city feel the fiscal impact of COVID-19?', *The Avenue*, 31 March, https://www.brookings.edu/blog/the-avenue/2020/03/ 31/when-will-your-city-feel-the-fiscal-impact-of-covid-19, last accessed 27 February 2022

Page, J., J. Gutman, P. Madden and D. Gandhi (2020) *Urban Economic Growth in Africa - A Framework*

for Analysing Constraints to Agglomeration, Working Paper 24, Africa Growth Initiative at Brookings, Washington, DC, https://www.brookings.edu/wp-content/uploads/2020/09/20.09.28_urban_economic_growth_in_africa_FINAL.pdf, last accessed 3 May 2022

Paköz, M. Z., C. Sözer, and A. Doğan (2021) 'Changing perceptions and usage of public and pseudo-public spaces in the post-pandemic city: The case of Istanbul', *URBAN DESIGN International*, **27**: 64–79

Paller, J. W. (2021) 'Everyday politics and sustainable urban development in the Global South', *Area Development and Policy* **6**(3): 319-336

Pan, H., X. Lu and K. Lei (2017) 'A comprehensive analysis of heavy metals in urban road dust of Xi'an, China: contamination, source apportionment and spatial distribution', *Science of the Total Environment* **609**: 1361-1369

Park, S., J. E. Mosley and C. M. Grogan (2018) 'Do residents of low-income communities trust organizations to speak on their behalf? Differences by organizational type', *Urban Affairs Review* **54**(1): 137-164

Parnell, S. (2016) 'Defining a global urban development agenda', *World Development* **78**: 529–540

Parnell, S. (2020) 'The enabling conditions of post-pandemic city government', *Environment and Planning B: Urban Analytics and City Science* **47**(7): 1143-1145

Parris, K. M., M. Amati, S. A. Bekessy, D. Dagenais, O. Fryd, A. K. Hahs, D. Hes, S. J. Imberger, S. J. Livesley, A. J. Marshall, J. R. Rhodes, C. G. Threlfall, R. Tingley, R. van der Ree, C. J. Walsh, M. L. Wilkerson and N. S. G. Williams (2018) 'The seven lamps of planning for biodiversity in the city', *Cities* **83**: 44-53

Pase, F., F. Chiariotti, A. Zanella and M. Zorzi (2020) 'Bike sharing and urban mobility in a post-pandemic world', *IEEE Access* **8**: 187291–187306

Pateman, R., H. Tuhkanen and S. Cinderby (2021) 'Citizen science and the sustainable development goals in low and middle income country cities', *Sustainability* **13**(17): 9534

Patterson, J., N. Soininen, M. Collier and C. M. Raymond (2021) 'Finding feasible action towards urban transformations', *NPJ Urban Sustainability* **1**(1): 28

Patz, J. A. and J. G. Siri (2021) 'Toward urban planetary health solutions to climate change and other modern crises', *Journal of Urban Health* **98**(3): 311-314

Pauleit, S., A. Vasquéz, S. Maruthaveeran, L. Liu and S. S. Cilliers (2021) 'Urban green infrastructure in the global South', in C. M. Shackleton, S. S. Cilliers, E, Davoren and M. J. du Toit (eds) *Urban Ecology of the Global South*, Cities and Nature. Springer, Switzerland, pp. 403-431

Pearsall, H. and I. Anguelovski (2016) 'Contesting and resisting environmental gentrification: Responses to new paradoxes and challenges for urban environmental justice', *Sociological Research Online* **21**(3): 121-127

Pellow, D. N. (2016) 'Toward a critical environmental justice studies: black lives matter as an environmental justice challenge', *Du Bois Review: Social Science Research on Race* **13**(2): 221-236

Pérez-Roman, E., M. Alvarado and M. Barrett (2020) 'Personalizing healthcare in smart cities' in S. McClellan (ed) *Smart Cities in Application*, Springer, Switzerland

Perng, S. (2019) 'Anticipating digital futures: Ruins, entanglements and the possibilities of shared technology making', *Mobilities* **14**(4): 418-434

Perrings, C., S. Baumgärtner, W. A. Brock, K. Chopra, M. Conte, C. Costello, A. Duraiappah, A. P. Kinzig, U. Pascual, S. Polasky, J. Tschirhart and A. Xepapadeas (2009) 'The economics of biodiversity and ecosystem services', in S. Naeem, D. E. Bunker, A. Hector, M. Loreau and C. Perrings (eds) *Biodiversity, Ecosystem, Functioning, And Human Well-Being : An Ecological and Economic Perspective,* Oxford University Press, United Kingdom, pp: 230-247

Perry, B. and B. Russell (2020) 'Participatory cities from the "outside in": The value of comparative learning', in D. Simon, H. Palmer and J. Riise (eds) *Comparative Urban Research from Theory to Practice; Co-production for Sustainability*, Policy Press, Bristol, pp. 133-154

Perry, B. and M. Atherton (2017) 'Beyond critique: The value of co-production in realising just cities?' *Local Environment* **22**(sup1): 36-51

Perry, B. G., Z. Patel, Y. Norén Bretzer and M. Polk (2018) 'Organising for co-production: Local interaction platforms for urban sustainability', *Politics and Governance* **6**(1)

Peters, A. (2020) 'Here are 11 more cities that have joined the car-free revolution', https://www.fastcompany.com/90456075/here-are-11-more-neighborhoods-that-have-joined-the-car-free-revolution, last accessed 22 May 2022

Petitjean, O. and S. Kishimoto (2017) 'Cities and citizens are writing the future of public services', in Dumontier, M. and Doherty, A. (eds), *Reclaiming Public Services: How Cities and Citizens are Turning Back Privatization*, Transnational Institute, Amsterdam, pp. 157-177

Pieterse, E. (2019) 'Urban governance and spatial transformation ambitions in Johannesburg', *Journal of Urban Affairs* **42**(1):20-38

Pieterse, M. (2021) 'Balancing socio-economic rights: Confronting COVID-19 in South Africa's informal urban settlements', *Nordic Journal of Human Rights* **39**(1): 33-50

Pimm, S. L., I. Donohue, J. M. Montoya and M. Loreau (2019) 'Measuring resilience is essential to understand it', *Nature Sustainability* **2**(10): 895–897

Pineo, H. (2020) 'Towards healthy urbanism: Inclusive, equitable and sustainable (THRIVES)–an urban design and planning framework from theory to praxis', *Cities & Health* 1-19

Pitts, A. J. (2017) 'Decolonial praxis and epistemic injustice', in I. J. Kidd, J. Medina, G. Pohlhaus and Jr (eds) *The Routledge Handbook of Epistemic Injustice*, First Edition, Routledge**,** United Kingdom, pp. 149-157

Pløger, J. (2004) 'Strife: Urban planning and agonism', *Planning Theory* **3**(1): 71-92

Plowright, R., J. Reaser, H. Locke, S. J. Woodley, J. A. Patz, D. Becker, G. Oppler, P. Hudson and G.M Tabor (2020) 'A call to action: Understanding land use-induced zoonotic spillover to protect environmental, animal, and human health', *EcoEvoRxiv*, 26 September, https://ecoevorxiv.org/cru9w/, last accessed 22 March 2022

Pomeroy, R. (2022) 'How the Ukraine war is driving up food and energy prices for the world', https://www.weforum.org/agenda/2022/03/ukraine-energy-and-food-radio-davos/, last accessed 04 May 2022

Pomponi, F., J. Hart, J. H. Arehart and B. D'Amico (2020) 'Buildings as a global carbon sink? A reality check on feasibility limits', *One Earth* **3**(2): 157-161

Pomponi, F., R. Saint, J. H. Arehart, N. Gharavi and B. D'Amico (2021) 'Decoupling density from tallness in analysing the life cycle greenhouse gas emissions of cities', *npj Urban Sustainability* **1**: 33

Popkin, B. M., C. Corvalan and L. M. Grummer-Strawn (2020) 'Dynamics of the double burden of malnutrition and the changing nutrition reality', *The Lancet* **395**(10217): 65-74

Porst, L. and P. Sakdapolrak (2018) 'Advancing adaptation or producing precarity? The role of rural-urban migration and translocal embeddedness in navigating household resilience in Thailand', *Geoforum* **97**: 35-45

Porter, L. and J. Barry (2015) 'Bounded recognition: urban planning and the textual mediation of Indigenous rights in Canada and Australia', *Critical Policy Studies* **9**(1): 22-40

Prasad, D., T. Alizadeh and R. Dowling (2021) 'Multiscalar Smart City Governance in India', *Geoforum* **121**:173-180

Prefeitura do Município de São Paulo (2021) *PlanClimaSP: Plano de ação climática do município de São Paulo 2020–2050*, São Paulo Municipality Climate Action Plan 2020–2050, https://www.prefeitura.sp.gov.br/cidade/secretarias/upload/meio_ambiente/ arquivos/PlanClimaSP_BaixaResolucao.pdf, last accessed 19 March 2022

Pulido, L. (2020) 'Racism and the anthropocene', in G. Mitman, M. Armiero and R. S. Emmet (eds) *Future Remains - A Cabinet of Curiosities for the Anthropocene,* University of Chicago Press, United States, pp. 116-128

Puttkamer, L. (2020) 'How can we make our cities more resilient to pandemics?', *parCitypatory*, 25 April, https://parcitypatory.org/2020/04/25/urban-resilience-pandemics, last accessed 23 April 2022

Pye, S., F. G. N. Li, J. Price and B. Fais (2017) 'Achieving net-zero emissions through the reframing of UK national targets in the post-Paris Agreement era', *Nature Energy* **2**(3): 1-7

Qiu, R. (2019) 'How Singapore is retraining workers for a more automated workplace', *Axios*, 7 March, https://www.axios.com/how-singapore-is-retraining-workers-for-a-more-automated-workplace-0d31856b-39e5-4159-8a59-9b3ee02e7419.html, last accessed 8 November 2021

Quian, Y, W. Zhou, W. Yu and S. T. A. Pickett (2015) 'Quantifying spatiotemporal pattern of urban greenspace: New insights from high resolution data', *Landscape Ecology* **30** (7): 1165-1173

Quinio, V. and G. Rodrigues (2021) *Net Zero: Decarbonising the City*, Centre for Cities and HSBC, London

Rachmawati, R., U. Choirunnisa, Z. A. Pambagyo, Y. A. Syarafina and R. A. Ghiffari (2021) 'Work from home and the use of ICT during the COVID-19 pandemic in Indonesia and its impact on cities in the future', *Sustainability* **13**(12): 6760

Rajagopal, B., M. Lawlor, C. Jimenez-Damary, F. de Varennes, P. Arrojo-Agudo, O. De Schutter and K. Boly Barry (2021) 'India must halt mass eviction that threatens to leave 100,000 homeless', United Nations Human Rights Office of the High Commissioner, https://www.ohchr.org/en/NewsEvents/Pages/DisplayNews.aspx?NewsID=27317andLangID=E, last accessed 22 march 2022

Ramaswami, A., K. Tong, A. Fang, R. M. Lal, A. S. Nagpure, Y. Li, H. Yu, D. Jiang, A. G. Russell, L. Shi, M. Chertow, Y. Wang and S. Wang (2017) 'Urban cross-sector actions for carbon mitigation with local health co-benefits in China', *Nature Climate Change* **7**(10): 736-742

Ramaswami, A., K. Tong, J. G. Canadell, R. B. Jackson, E. K. Stokes, S. Dhakal, M. Finch, P. Jittrapirom, N. Singh, Y. Yamagata, E. Yewdall, L. Yona and K. C. Seto (2021) 'Carbon analytics for net-zero emissions sustainable cities', *Nature Sustainability* **4**(6): 460-463

Ramirez-Rubio, O., C. Daher, G. Fanjul, M. Gascon, N. Mueller, L. Pajín, A. Plasencia, D. Rojas-Rueda, M. Thondoo and M. J. Nieuwenhuijsen (2019) 'Urban health: An example of a "health in all policies" approach in the context of SDGs implementation', *Globalization and Health* **15**(1): 1-21

Randrup, T. B., A. Buijs, C. C. Konijnendijk and T. Wild (2020) 'Moving beyond the nature-based solutions discourse: Introducing nature-based thinking', *Urban Ecosystems* **23**(4): 919-926

Rashidi, K. and A. Patt (2018) 'Subsistence over symbolism: The role of transnational municipal networks on cities' climate policy innovation and adoption', *Mitigation and Adaptation Strategies for Global Change* **23**(4): 507-523

Ratté, S., C. Excell and L. Williams (2014) 'Crossing the digital divide to protect the environment', https://www.wri.org/insights/crossing-digital-divide-protect-environment, last accessed 13 October 2021

Raven, J., B. Stone, G. Mills, J. Towers, L. Katzschner, M. F. Leone, P. Gaborit, M. Georgescu, M.

Hariri, J. Lee, J. LeJava, A. Sharifi, C. Visconti and A. Rudd (2018) 'Urban planning and urban design', in C. Rosenzweig, W. D. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal and S. A. Ibrahim (eds) *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*, Cambridge University Press, Cambridge, pp. 139-172

Ravenelle, A. J., K. C. Kowalski and E. Janko (2021) 'The side hustle safety net: Precarious workers and gig work during COVID-19', *Sociological Perspectives* **64**(5): 898-919

Ravetz, J., A. Neuvonen and R. Mäntysalo (2021) 'The new normative: Synergistic scenario planning for carbon-neutral cities and regions', *Regional Studies* **55**(1): 150-163

Rayner, T., S. Oberthür and L. Hermwille (2021) 'A sectoral perspective on international climate governance: Key findings and research priorities', *Earth System Governance* **8**: 100105

Razavi, S., C. Behrendt, M. Bierbaum, I. Orton and L. Tessier (2020) 'Reinvigorating the social contract and strengthening social cohesion: Social protection responses to COVID€19', *International Social Security Review* **73**(3): 55-80

RCN and ARUP (2021) *Distributed Renewable Energy*: *A Pathway for Resilient Recovery in Cities,* Resilient Cities Network (RCN) and Arup Group, https://www.arup.com/perspectives/publications/promotional-materials/section/distributed-renewable-energy-a-pathway-for-resilient-recovery-in-cities, last accessed 11 May 2022

RECIPES (2020) *Precaution and Innovation: Exploring Collaboratively a Significant Relationship*, Reconciling Science, Innovation and Precaution through the Engagement of Stakeholders (RECIPES), https://recipes-project.eu/sites/default/files/2020-03/PolicyBrief_Recipes_Online20200320_01.pdf, last accessed 25 October 2021

Reckien, D., F. Creutzig, B. Fernandez, S. Lwasa, M. Tovar-Restrepo, D. McEvoy and D. Satterthwaite (2017) 'Climate change, equity and the Sustainable Development Goals: An urban perspective', *Environment and Urbanization* **29**(1): 159-182

Reckien, D., M. Salvia, O. Heidrich, J. M. Church, F. Pietrapertosa, S. De Gregorio-Hurtado, V. D'Alonzo, A. Foley, S. G. Simoes, E. K. Lorencová, H. Orru, K. Orru, A. Wejs, J. Flacke, M. Olazabal, D. Genelleti, E. Feliu, S. Vasilie, C. Nador, A. Krook-Riekkola, M. Matosovic, P. A. Fokaides, B. I. Ioannou, A. Flamos, N. Spyridaki, M. V. Balzan, O. Fülöp, I. Paspaldzhiev, S. Grafakos and R. Dawson (2018) 'How are cities planning to respond to climate change? Assessment of local climate plans from 885 cities in the EU-28', *Journal of Cleaner Production* **191**: 207-219

Reckien, D., S. Lwasa, D. Satterthwaite, D. McEvoy, F. Creutzig, M. Montgomery, D. Schensul, D. Balk, I. A. Khan, B. Fernandez, D. Brown, J. C. Osorio, M. Tovar-Restrepo, A. de Sherbinin, W. Feringa, A. Sverdlik, E. Porio, A. Nair, S. McCormick and E. Bautista (2018) 'Equity, environmental justice, and urban climate change', in C. Rosenzweig, W. D. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal, and S. A. Ibrahim (eds) *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*, Cambridge University Press, Cambridge, pp. 173-224

Rémillard-Boilard, S., T. Buffel and C. Phillipson (2021) 'Developing age-friendly cities and communities: Eleven case studies from around the world', *International Journal of Environmental Research and Public Health* **18**(1): 133

Repette, P., J. Sabatini-Marques, T. Yigitcanlar, D. Sell and E. Costa (2021) 'The evolution of city-as-a-platform: Smart urban development governance with collective knowledge-based platform urbanism', *Land* **10**(1): 33

Restrepo-Mieth, A. (2021) 'Examining the dynamics between formal and informal institutions in progressive city planning', *Urban Affairs Review*

Reuschke, D. and C. Ekinsmyth (2021) 'New spatialities of work in the city', *Urban Studies* **58**(11): 2177–2187

Reuters (2021) 'Factbox: Uber's legal challenges around the world', *Reuters*, 19 February, https://www.reuters.com/article/us-uber-britain-factbox-idUSKBN2AJ1N7, last accessed 8 November 2021

Revi, A., D. Satterthwaite, F. Aragón-Durand, J. Corfee-Morlot, R. B. Kiunsi, M. Pelling, D. Roberts, W. Solecki, S. P. Gajjar and A. Sverdlik (2014) 'Towards transformative adaptation in cities: The IPCC's Fifth Assessment', *Environment and Urbanization* **26**(1): 11-28

Rhodes, C. J. (2017) 'The imperative for regenerative agriculture', *Science Progress* **100**(1): 80-129

Riahi, K., E. Kriegler, N. Johnson, C. Bertram, M. den Elzen, J. Eom, M. Schaeffer, J. Edmonds, M. Isaac, V. Krey, T. Longden, G. Luderer, A. Méjean, D. L. McCollum, S. Mima, H. Turton, D. P. van Vuuren, K. Wada, V. Bosetti, P. Capros, P. Criqui, M. Hamdi-Cherif, M. Kainuma, and O. Edenhofer (2015) 'Locked into Copenhagen pledges—implications of short-term emission targets for the cost and feasibility of long-term climate goals', *Technological Forecasting and Social Change* **90**: 8-23

Rice, J. L., D. A. Cohen, J. Long and J. R. Jurjevich (2020) 'Contradictions of the climate€friendly city: New perspectives on eco€gentrification and housing justice', *International Journal of Urban and Regional Research* **44**(1): 145-165

Richmond MakerLabs (2022) https://richmondmakerlabs.uk, last accessed 20 May 2022

Richmond, A., I. Myers and H. Namuli (2018) 'Urban informality and vulnerability: A case study in Kampala, Uganda', *Urban Science* **2**(1): 22

Rigon, A. and V. Castán Broto (eds) (2021) *Inclusive Urban Development in the Global South: Intersectionality, Inequalities, and Community*, Routledge, New York and London

Rivera-Córdova, A. (2021) 'Relación densidad y pobreza con casos confirmados por Coronavirus en la región metropolitana', *Revista Médica Clínica Las Condes* **32**(1): 81–89

RNSF (Research, Network and Support Facility)(2017) *Extending Coverage: Social Protection and the Informal Economy. Experiences and Ideas from Researchers and Practitioners*, Research, Network and Support Facility, ARS Progetti, Rome; Lattanzio Advisory, Milan and AGRER, Brussels

Roberts, B. H. (2014) *Managing Systems of Secondary Cities: Policy Responses in International Development,* Cities Alliance/UNOPS, Brussels

Roberts, D. (2018) 'Clean energy technologies threaten to overwhelm the grid. Here's how it can adapt', *Vox*, 30 November, https://www.vox.com/energy-and-environment/2018/11/30/17868620/renewable-energy-power-grid-architecture, last accessed 11May 2022

Robin, E. and V. Castán Broto (2021) 'Towards a postcolonial perspective on climate urbanism', *International Journal of Urban and Regional Research* **45**(5): 869-878

Robinson, C. J., K. Maclean, R. Hill, E. Bock and P. Rist (2016) 'Participatory mapping to negotiate indigenous knowledge used to assess environmental risk', *Sustainability Science* **11**(1): 115-126

Rockefeller Foundation and Arup (2018) 'City Resilience Index: 52 Indicators', *City Resilience Index,* https://www.cityresilienceindex.org, last accessed 11 May 2022

Rodgers, S. and S. Moore (2018) 'Platform urbanism: An introduction', *Mediapolis* **3**(4), https://www.mediapolisjournal.com/2018/10/platform-urbanism-an-introduction, last accessed 20 May 2022

Rodriguez-Pose, A. and A. Bwire (2004) 'The economic (in)efficiency of devolution', *Environment and Planning* **36**(11):1907-1928

Roe, J., P. A. Aspinall and C. Ward Thompson (2016) 'Understanding relationships between health, ethnicity, place and the role of urban green space in deprived urban communities', *International Journal of Environmental Research and Public Health* **13**(7): 681

Rogers, A., J. Raymer and F. Willekens (2002) 'Capturing the age and spatial structures of migration', *Environment and Planning A: Economy and Space* **34**(2): 341-359, https://doi.org/10.1068/a33226, last accessed 6 April 2022

Roland Berger (2021) 'Green tech industry remains on course for growth', https://www.rolandberger.com/en/Insights/Publications/Green-tech-industry-remains-on-course-for-growth.html, last accessed 8 November 2021

Romanello, M., A. McGushin, C. Di Napoli, P. Drummond, N. Hughes, L. Jamart, H. Kennard, P. Lampard, B. S. Rodriguez, N. Arnell and S. Ayeb-Karlsson (2021) 'The 2021 report of the Lancet Countdown on health and climate change: code red for a healthy future', *The Lancet* **398**(10311): 1619-1662

Romero-Díaz, A., J. D. Ruiz-Sinoga, F. Robledano-Aymerich, E. C. Brevik and A. Cerdà (2017) 'Ecosystem responses to land abandonment in Western Mediterranean Mountains', *Catena* **149**: 824-835

Romero-Lankao, P., N. Frantzeskaki and C. Griffith (2018) 'Sustainability transformation emerging from better governance', in T. Elmqvist, X. Bai, N. Frantzeskaki, C. Griffith, D. Maddox, T. McPhearson, S. Parnell, P. Romero-Lankao, D. Simon and M. Watkins (eds) *Urban Planet*, Cambridge University Press, Cambridge, pp263-280

Romero-Lankao, P., S. Burch, S. Hughes, K. Auty, A. Aylett, K. Krellenberg, R. Nakano, D. Simon and G. Ziervogel (2018) 'Governance and policy', in C. Rosenzweig, W.D. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal, and S.A. Ibrahim (eds) *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Cambridge University Press, Cambridge, pp585-606

Roome, J. (2016) 'The digital divide: A challenge to overcome in tackling climate change', *World Bank Blogs*, 14 January, https://blogs.worldbank.org/climatechange/digital-divide-challenge-overcome-tackling-climate-change, last accessed 13 October 2021

Rosa-Aquino, P. (2019) '5 ways we need to adapt to climate change – or pay the price', *Grist,* 10 September, https://grist.org/article/5-ways-we-need-to-adapt-to-climate-change-or-pay-the-price/, last accessed 13 May 2022

Rose, J. and A. Omolo (2013) 'Six case studies of local participation in Kenya', Worldbank https://openknowledge.worldbank.org/handle/10986/17556?locale-attribute=es, last accessed 22 march 2022

Rosenthal, S. and W. Strange (2020) 'How close is close? The spatial reach of agglomeration economies', *Journal of Economic Perspectives* **34**(3): 27-49

Rosenzweig, C., W.D. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal and S.A. Ibrahim (2018) *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*, Cambridge University Press, Cambridge

Rosner, D. K., S. Lindtner, I. Erickson, L. Forlano, S. Jackson and B. Kolko (2014) 'Making cultures: Building things & building communities', *Proceedings of the Companion Publication of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing*, 113–116

Rossello, S. and P. Dewitte (2020) 'Anonymization by Decentralization: The case of Covid-19 contact-tracing apps', *European Law Blog*, 25 May, https://europeanlawblog.eu/2020/05/25/anonymization-by-decentralization-the-case-of-covid-19-contact-tracing-apps, last accessed 25 February 2022

Ruiz-Campillo, X., V. Castán Broto and L. Westman (2021) 'Motivations and intended outcomes in local governments' declarations of climate emer-

gency', *Politics and Governance* **9**(2): 17-28
Rupprecht Consult (2019) *Guidelines for Developing and Implementing a Sustainable Urban Mobility Plan*, Second Edition, https://www.eltis.org/sites/default/files/sump-guidelines-2019_mediumres.pdf, last accessed 19 April 2022
Ryan, M. and A. Gregory (2019) 'Ethics of using smart city AI and big data: The case of four large European cities', *The ORBIT Journal* **2**(2): 1-36
Sachs, J. D., C. Kroll, G. Lafortune, G. Fuller and F. Woelm (2021) *Sustainable Development Report 2021: The Decade of Action for the Sustainable Development Goals*, Cambridge University Press, Cambridge
Sachs, J. D., G. Schmidt-Traub, M. Mazzucato, D. Messner, N. Nakicenovic and J. Rockström, (2019) 'Six transformations to achieve the Sustainable Development Goals', *Nature Sustainability* **2**(9): 805–814
Sadowski, J. (2020) 'Cyberspace and cityscapes: On the emergence of platform urbanism', *Urban Geography* **41**(3): 448-452
Saint, G. (2021) 'Life after the pandemic: What is the "next normal" for mobility?', *Kantar*, 5 May, https://www.kantar.com/north-america/inspiration/mobility/life-after-the-pandemic-the-next-normal-for-mobility, last accessed 3 March 2022
Saint, R. and F. Pomponi (2021) 'Cities and climate change: Why low-rise buildings are the future – not skyscrapers', *The Conversation*, 27 October, https://theconversation.com/cities-and-climate-change-why-low-rise-buildings-are-the-future-not-skyscrapers-170673, last accessed 6 June 2022
Saldarriaga, N., K. K. Shrestha, P. McManus and A. Bajracharya (2020) 'Greening Sydney: Attitudes, barriers and opportunities for tree planting', *Australian Geographer* **51**(4): 469-488
Salem, J. (2021) 'Are we destined for a dystopian tech-future?', SCIplanet, https://www.bibalex.org/SCIplanet/en/Article/Details.aspx?id=13696, last accessed 25 February 2022
Sallis, J. F. and K. Glanz (2009) 'Physical activity and food environments: Solutions to the obesity epidemic', *Milbank Quarterly* **87**(1): 123–154
Sallis, J. F., E. Cerin, J. Kerr, M. A. Adams, T. Sugiyama, L. B. Christiansen, J. Schipperijn, R. Davey, D. Salvo, L. D. Frank, I. de Bourdeaudhuij and N. Owen (2020) 'Built environment, physical activity, and obesity: Findings from the International Physical Activity and Environment Network (IPEN) adult study', *Annual Review of Public Health* **41**(1): 119–139
Samarakoon, S., P. Munro, C. Zalengera and M. Kearnes (2022) 'The after-lives of off-grid solar: The dynamics of repair and e-waste in Malawi', *Environmental Innovation and Societal Transitions* **42**: 317-330
Samet, J. M. (2019) 'Pollution', in S. Galea, C. K. Ettman and D. Vlahov (eds) *Urban Health*, Oxford University Press, New York, pp. 112-128
Sánchez-Ancochea, D. (2020) *The Costs of Inequality in Latin America: Lessons and Warnings for the Rest of the World*, Bloomsbury Publishing
Sanchez-Guevara, C., M. N. Peiró, J. Taylor, A. Mavrogianni and J. N. González (2019) 'Assessing population vulnerability towards summer energy poverty: Case studies of Madrid and London', *Energy and Buildings* **190**: 132-143
Sanchez-Paramo, C. (2020) COVID-19 will hit the poor hardest. Here's what we can do about it', *World Bank Blogs*, 23 April, https://blogs.worldbank.org/voices/covid-19-will-hit-poor-hardest-heres-what-we-can-do-about-it, last accessed 6 June 2022
Santamouris, M. (2014) 'Cooling the cities – A review of reflective and green roof mitigation technologies to fight heat island and improve comfort in urban environments', *Solar Energy* **103**: 682–703
Sapra, I. and B. P. Nayak (2021) 'The protracted exodus of migrants from Hyderabad in the time of COVID-19', *Journal of Social and Economic Development* **23**(Suppl 2): 398–413
Satorras, M., I. Ruiz-Mallén, A. Monterde and H. March (2020) 'Co-production of urban climate planning: Insights from the Barcelona Climate Plan', *Cities* **106**: 102887
Satterthwaite, D. and S. Bartlett (2017) 'The full spectrum of risk in urban centres: Changing perceptions, changing priorities', *Environment and Urbanization* **29**(1): 3-14
Satterthwaite, D., A. Sverdlik and D. Brown (2019) 'Revealing and responding to multiple health risks in informal settlements in Sub-Saharan African cities', *Journal of Urban Health* **96**(1): 112-122
Satterthwaite, D., D. Archer, S. Colenbrander, D. Dodman, J. Hardoy, D. Mitlin and S. Patel (2020) 'Building resilience to climate change in informal settlements', *One Earth* **2**(2): 143-156
Satterthwaithe, D. (2021) 'Definitions matter – part one', *International Institute for Environment and Development Blog*, 10 October, https://www.iied.org/definitions-matter-part-one, last accessed 13 May 2022
Schell, R. and D. Kaufman (2017) 'Community building among older adults in a digital game environment', *Proceedings of the 9th International Conference on Computer Supported Education (CSEDU)*, SCITEPRESS – Science and Technology Publications, Portugal
Schinnerl, M. and D. Greiling (2019) 'Urban poverty in Europe – poverty reduction policies and measures', *Review of Applied Socio-Economic Research* **18**(2): 118-128.
Schipper, E. L. F., S. E. Eriksen, L. R. F. Carril, B. C. Glavovic and Z. Shawoo (2021) 'Turbulent transformation: Abrupt societal disruption and climate resilient development', *Climate and Development* **13**(6): 467-474
Schlaufer, C. (2021) 'Why do nondemocratic regimes promote e€participation? The case of Moscow's active citizen online voting platform', *Governance*, **34**(3), 821-836
Schot, J., L. Kanger and G. Verbong (2016) 'The roles of users in shaping transitions to new energy systems', *Nature Energy* **1**(5): 1-7
Schotte, S. and Zizzamia, R. (March 2021) *The Livelihood Impacts Of COVID-19 In Urban South Africa: A View from Below*, WIDER Working Paper 2021/56, UNU-Wider, Finland, https://www.wider.unu.edu/sites/default/files/Publications/Working-paper/PDF/wp2021-56-livelihood-impacts-COVID-19-urban-South-Africa.pdf, last accessed 4 May 2022
Schraven, D., S. Joss and M. de Jong (2021) 'Past, present, future: Engagement with sustainable urban development through 35 city labels in the scientific literature 1990–2019', *Journal of Cleaner Production* **292**: 125924
Schulze, E. and E.Y. King (2021) 'States, cities that expected to go bankrupt from pandemic now seeing cash surplus', *ABC News*, 22 July, https://abcnews.go.com/US/states-cities-expected-bankrupt-pandemic-now-cash-surplus/story?id=78977318, last accessed 20 May 2022
Schwab, K., S. Zahidi and WEF (2020) *The Global Competitiveness Report, Special Edition 2020: How Countries are Performing on the Road to Recovery*, World Economic Forum, Cologny, https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2020.pdf, last accessed 3 May 2022
Scott, D., H. Davies and M. New (eds) (2019) *Mainstreaming Climate Change in Urban Development: Lessons from Cape Town*, University of Cape Town Press, Cape Town
Scripps Institution of Oceanography, UC San Diego (2022) 'The Keeling curve', *The Keeling Curve*, https://keelingcurve.ucsd.edu/, last accessed 23 April 2022
Scruggs, G. (2021) 'The Airbnb effect: Is a housing shortage inevitable?', *RICS Modus*, 24 September, https://ww3.rics.org/uk/en/modus/built-environment/homes-and-communities/the-airbnb-effect--is-a-housing-shortage-inevitable-.html, last accessed 1 May 2022
SDI (2021) 'Covid-19: Fostering community resilience amid the pandemic', https://sdinet.org/2021/09/covid-19-fostering-community-resilience-amid-the-pandemic/, last accessed 19 March 2022
SDI and Know Your City (2018) *Know Your City: Slum Dwellers Count*, SDI, Cape Town, https://sdinet.org/publication/know-city-slum-dwellers-count/, last accessed 11 May 2022
Seethaler-Wari, S. (2018) 'Urban planning for the integration of refugees: The importance of local factors', *Urban Planning* **3**(4): 141-155
SEI, IISD, ODI, E3G, and UNEP (2021) *The Production Gap Report,* SEI, Stockholm, https://productiongap.org/wp-content/uploads/2021/10/PGR2021_web.pdf, last accessed 23 April 2022
Serin, B (2019) 'Inequality is being built into cities: Segregated playgrounds are just the start', *The Conversation*, 8 May, https://theconversation.com/inequality-is-being-built-into-cities-segregated-playgrounds-are-just-the-start-115676, last accessed 5 May 2022
Seto, K. C., G. Churkina, A. Hsu, M. Keller, P. W. G. Newman, B. Qin and A. Ramaswami (2021) 'From low-to net-zero carbon cities: The next global agenda', *Annual Review of Environment and Resources* **46**: 377-415, https://doi.org/10.1146/annurev-environ-050120-113117, last accessed 19 March 2022
Seto, K. C., S. Parnell, and T. Elmqvist (2013) 'A global outlook on urbanization', in T. Elmqvist, M. Fragkias, J. Goodness, B. Güneralp, P. J. Marcotullio, R. I. McDonald, S. Parnell, M. Schewenius, M. Sendstad, K. C. Seto and C. Wilkinson (eds) *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities,* Springer Dordrecht, Netherlands, pp. 1–12
Shaban, A. and Z. Aboli (2021) 'Socio-spatial segregation and exclusion in Mumbai', in M. van Ham, T. Tammaru, R. Ubarevi€en€and H. Janssen (eds) *Urban Socio-Economic Segregation and Income Inequality: A global perspective*, Springer Cham, Switzerland
Shand, W. (2017) 'Local level finance: Community-led Contributions to Delivering Urban Development', Briefing, International Institute for Environment and Development, http://www.jstor.com/stable/resrep02635, last accessed 25 February 2022
Shand, W. and S. Colenbrander (2018) 'Financing the inclusive city: The catalytic role of community savings', *Environment and Urbanization* **30**(1):175-190
Sharifi, A. (2016) 'From garden city to eco-urbanism: the quest for sustainable neighborhood development', *Sustainable Cities and Society* **20**: 1–16
Sharifi, A. (2019) 'Resilient urban forms: A macro-scale analysis', *Cities* **85**: 1–14
Sharifi, A. (2021) 'Co-benefits and synergies between urban climate change mitigation and adaptation measures: A literature review', *Science of The Total Environment* **750**: 141642
Sharifi, A. and A. Murayama (2013) 'A critical review of seven selected neighborhood sustainability assessment tools', *Environmental Impact Assessment Review* **38**: 73–87
Sharifi, A. and A. R. Khavarian-Garmsir (2020a) 'The COVID-19 pandemic: Impacts on cities and major lessons for urban planning, design, and management', *Science of the Total Environment* **749**: 1-14
Sharifi, A. and A. R. Khavarian-Garmsir (2020b) 'Urban resilience: Ten lessons from the COVID-19 pandemic', *HazNet*, http: //haznet.ca/urban-resilience-ten-lessons-covid-19-pandemic/, last accessed 6 May 2022
Sharifi, A., A. R. Khavarian-Garmsir and R. K. R. Kummitha (2021) 'Contributions of smart city solutions and technologies to resilience against the COVID-19 pandemic: A literature review', *Sustainability* **13**(14): 8018
Sharifi, A., M. Pathak, C. Joshi and B. He (2021) 'A systematic review of the health co-benefits of urban climate change adaptation', *Sustainable Cities and Society* **74**: 103190

Shaw, A., N. O'Brien, K. Flott, S. Leatherman, A. L. Neves and M. Durkin (2021) 'The urgent need to identify and evaluate patient safety interventions in fragile, conflict-affected and vulnerable settings', *Journal of Global Health* **11**: 03082

Sheikh, F. A. and S. Bhaduri (2021) 'Policy space for informal sector grassroots innovations: Towards a "bottom-up" narrative', *International Development Planning Review* **43**(1): 115-137

Sheller, M. (2018) *Mobility Justice: The Politics of Movement in an Age of Extremes*, Verso Books, New York and London

Shelton, T., M. Zook and A. Wiig (2015) 'The "actually existing smart city"', *Cambridge Journal of Regions, Economy and Society* **8**(1): 13-25

Sheridan, D. (2018) *SDI Energy Justice Programme: Progress Report*, SDI, Cape Town, https://sdinet.org/wp-content/uploads/2018/02/SOLAR-REPORT-2018.pdf, last accessed 24 March 2022

Shi, L., E. Chu, I. Anguelovski, A. Aylett, J. Debats, K. Goh, T. Schenk, K. C. Seto, D. Dodman, D. Roberts, J. T. Roberts and S. D. VanDeveer (2016) 'Roadmap towards justice in urban climate adaptation research', *Nature Climate Change* **6**: 131-137

Shokouhyar, S., S. Shokoohyar, A. Sobhani and A. J. Gorizi (2021) 'Shared mobility in post-COVID era: New challenges and opportunities', *Sustainable Cities and Society* **67**: 102714

Shrestha, P., G. E. Small and A. Kay (2020) 'Quantifying nutrient recovery efficiency and loss from compost-based urban agriculture', *PloS One* **15**(4): e0230996

Silva, P. (2016) 'Tactical urbanism: Towards an evolutionary cities' approach?', *Environment and Planning B: Planning and Design* **43**(6): 1040–1051

Silverman, R. M. (2018) 'Rethinking shrinking cities: Peripheral dual cities have arrived', *Journal of Urban Affairs* **42(**3): 294-311, https://doi.org/10.1080/07352166.2018.1448226, last accessed 3 April 2022

Simon D. (2016a) 'The potential of the green economy in addressing urban environmental change', in K.C. Seto, W.D. Solecki and C.A. Griffith (eds) *Handbook on Urbanization and Global Environmental Change*, Routledge, London and New York, pp. 479-493

Simon, D. (2013) 'Climate and environmental change and the potential for greening African cities', *Local Economy* **28**(2): 203-217

Simon, D. (2015) 'The potential of the green economy and urban greening for addressing urban environmental change', in K. C. Seto, W. D. Solecki and C. A. Griffith (eds) *The Routledge Handbook of Urbanization and Global Environmental Change*, Routledge, New York and London, pp. 455-469

Simon, D. (2016) 'Green cities: From tokenism to incrementalism and transformation', in D. Simon (ed) *Rethinking Sustainable Cities: Accessible, Green and Fair*, Policy Press, Bristol, pp. 61-105

Simon, D. (2021) 'Co-productive tools for transcending the divide: Building urban–rural partnerships in the spirit of the New Leipzig Charter', *Land* **10**(9): 894

Simon, D. and W. Solecki (2018) 'Box 1.2: Urban climate change transformation', in C. Rosenzweig, W. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal and S. A. Ibrahim (eds) *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*, Cambridge University Press, New York

Simon, D., A. Arano, M. Cammisa, B. Perry, S. Pettersson, J. Riise, S. Valencia, M. Oloko, T. Sharma, Y. Vora and W. Smit (2021) 'Cities coping with COVID-19: Comparative perspectives', *City* **25**(1-2): 129-170

Simon, D., C. Griffith and H. Nagendra (2018) 'Rethinking urban sustainability and resilience', in T. Elmqvist, X. Bai, N. Frantzeskaki, C. Griffith, D. Maddox, T. McPhearson, S. Parnell, P. Romero-Lankao, D. Simon and M. Watkins (eds) *Urban Planet: Knowledge Towards Sustainable Cities*, Cambridge University Press, Cambridge, pp. 149-162

Simon, D., D. McGregor and K. Nsiah-Gyabaah (2004) 'The changing urban-rural interface of African cities: Definitional issues and an application to Kumasi, Ghana', *Environment and Urbanization* **16**(2): 235-248

Simon, D., J. Goodness, J. Puppim de Oliviera, S. Lwasa, L. V. Macedo, J. Kavonic, E. Hermansson Török and T. Elmqvist, (2021) 'Urban governance of and for urban green and blue infrastructure', in C. M. Shackleton, S. S. Cilliers, E. Davoren and M. J. du Toit (eds) *Urban Ecology of the Global South*, Springer Cham, Switzerland, pp. 403-431

Simonofski, A., E. Hertoghe, M. Steegmans, M. Snoeck and Y. Wautelet (2021) 'Engaging citizens in the smart city through participation platforms: A framework for public servants and developers', *Computers in Human Behavior* **124**: 106901

Singh, R. K., J. Pretty and S. Pilgrim (2010) 'Traditional knowledge and biocultural diversity: Learning from tribal communities for sustainable development in northeast India', *Journal of Environmental Planning and Management* **53**(4): 511-533

Singh, R., X. Wang, J. C. Mendoza and E. K. Ackom (2015) 'Electricity (in)accessibility to the urban poor in developing countries', *WIREs Energy and Environment* **4**(4): 339-353

Sisson, P. (2020a) 'How the '15-Minute City' could help post-pandemic recovery', *Bloomberg Asia Edition,* 16 July, https://www.bloomberg.com/news/articles/2020-07-15/mayors-tout-the-15-minute-city-as-covid-recovery, last accessed 6 May 2022

Sisson, P. (2020b) 'What is a 15-minute city?', *CityMonitor*, 21 September, https://citymonitor.ai/environment/what-is-a-15-minute-city, last accessed 6 May 2022

Sitas, R. and B. Perry (2021) *Whose Heritage Matters: Mapping, Making and Mobilising Cultural Heritage in Cape Town*, Universty of Sheffield Print and Design, Sheffield

Slack, E. (2019) *Metropolitan Governance Principles and Practice*, Discussion Paper No. IDB-DP-659, Inter-American Development Bank, http://dx.doi.org/10.18235/0001576, last accessed 25 February 2022

Smit, W., D. Simon, E. Durakovic, M. Dymitrow, G. Haysom, K. Hemström and J. Riise (2021) 'The challenge of conflicting rationalities about urban development: Experiences from Mistra Urban Futures' transdisciplinary urban research', *Trialog* **137**(2): 31-37.

Smith, J., S. E. Davies, H. Feng, C. C. R. Gan, K. A. Grépin, S. Harman, A. Herten-Crabb, R. Morgan, N. Vandan and C. Wenham (2021) 'More than a public health crisis: A feminist political economic analysis of COVID-19', *Global Public Health* **16**(8-9): 1364-1380

Smith, K. R., S. Mehta and M. Maeusezahl-Feuz (2004) 'Indoor air pollution from household use of solid fuels', in M. Ezzati, A. D. Lopez and C. J. L. Murray (eds) *Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors*, Volume 1, World Health Organization, Geneva, pp. 1435-1493

Smith, P., S. J. Davis, F. Creutzig, S. Fuss, J. Minx, B. Gabrielle, E. Kato, R. B. Jackson, A. Cowie, E. Kriegler, D. P. van Vuuren, J. Rogeli, P. Ciais, J. Milne, D. McCollum, G. Peters, R. Andrew, G. Shreshtha, P. Friedlingstein, T. Gasser, A. Grübler, W. K. Heidug, M. Jonas, C. D. Jonas, F. Kraxxner, E. Litteton, J. Lowe, J. R. Moreira, N. Nakicenovic, M. Obersteiner, A. Patwardhan, M. Rogner, E. Rubin, A. Sharifi, A. Torvenger, Y. Yamagata, J. Edmonds and C. Yongsung, (2016) 'Biophysical and economic limits to negative CO 2 emissions', *Nature Climate Change* **6**: 42-50

Sommer, M., S. Ferron, S. Cavill and S. House (2015) 'Violence, gender and WASH: Spurring action on a complex, under-documented and sensitive topic', *Environment and Urbanization* **27**(1): 105-116

Souza, C. (2001) 'Participatory budgeting in Brazilian cities: Limits and possibilities in building democratic institutions', *Environment and Urbanization* **13**(1): 159-184

Sovacool, B. K. (2011) 'Conceptualizing urban household energy use: Climbing the "Energy Services Ladder"' *Energy Policy* **39**(3): 1659-1668

Sovacool, B. K. (2019) 'Toxic transitions in the lifecycle externalities of a digital society: the complex afterlives of electronic waste in Ghana', *Resources Policy* **64**: 101459

Sovacool, B. K., A. Hook, M. Martiskainen, A. Brock and B. Turnheim (2020) 'The decarbonisation divide: Contextualizing landscapes of low-carbon exploitation and toxicity in Africa', *Global Environmental Change* **60**: 102028

Spencer, J. N. H., D. Marasco and M. Eichinger (2022) 'Planning for emerging infectious disease pandemics*', Journal of the American Planning Association* **88**(1): 113–126

Spiliotopoulou, M. and Roseland, M. (2021) 'Urban sustainability via urban productivity? A conceptual review and framework proposal', *Local Environment* **2**: 177-196

Stacey, P. and C. Lund (2016) 'In a state of slum: governance in an informal urban settlement in Ghana', *The Journal of Modern African Studies* **54**(4):591-615

Stafford, L. (2020) 'Planning inclusively: disrupting "ableism" to make communities just for all', *QUT Centre for Justice Briefing Paper* (10): 1-12

Standing, G. (2018) 'The Precariat: today's transformative class?', *Development* **61**(1-4): 115-121

Stark, L. (2021) 'Mobile money and the impact of mobile phone regulatory enforcement among the urban poor in Tanzania', *Human Technology* **17**(1): 22-44

StartUs Insights (2021) 'Top 8 circular economy trends & innovations in 2021', *StartUs Insights*, https://www.startus-insights.com/innovators-guide/top-8-circular-economy-trends-innovations-in-2021/, last accessed 8 November 2021

State Government of Victoria (2022) '20-minute neighbourhoods', *Plan Melbourne 2017-2050*, https://www.planning.vic.gov.au/policy-and-strategy/planning-for-melbourne/plan-melbourne/20-minute-neighbourhoods, last accessed 29 May 2022

Stecklov, G. (2008) *The Components of Urban Growth in Developing Countries*, Unpublished manuscript prepared for the United Nations Population Division, https://www.researchgate.net/publication/326189843_The_Components_of_Urban_Growth_in_Developing_Countries, last accessed 6 April 2022

Steen, K. and E. van Bueren (2017) *Urban Living Labs: A Living Lab Way of Working*, Amsterdam Institute for Advanced Metropolitan Solutions, https://www.ams-institute.org/documents/28/AMS_Living_Lab_Way_of_Working-ed4.pdf, last accessed 4 February 2022

Steg, L., and R. Gifford (2005) 'Sustainable transportation and quality of life', *Journal of Transport Geography* **13**(1): 59-69

Stephenson, M. (2015) 'Trust in government and public health: Corruption and Ebola revisited', https://globalanticorruptionblog.com/2015/01/22/trust-in-government-and-public-health-corruption-and-ebola-revisited, last accessed 25 February 2022

Stibbe, D. and D. Prescott (2020) *The SDG Partnership Guidebook: A Practical Guide to Building High Impact Multi-Stakeholder Partnerships for The Sustainable Development Goals*, The Partnering Initiative and UNDESA, New York

Stiglitz, J. (2020) 'Point of view: Conquering the great divide', *Finance and Development* **0057**(03): 7-19, https://www.imf.org/external/pubs/ft/fandd/2020/09/pdf/COVID19-and-global-inequality-joseph-stiglitz.pdf, last accessed 6 May 2022

Subbaraman, R., J. O'Brien, T. Shitole, S. Shitole, K. Sawant, D. E. Bloom and A. Patil-Deshmukh

(2012) 'Off the map: The health and social implications of being a non-notified slum in India', *Environment and Urbanization* **24**(2): 643-663

Subbaraman, R., T. Jhaveri and R. R. Nathavitharana (2020) 'Closing gaps in the tuberculosis care cascade: An action-oriented research agenda', *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases* **19**: 100144

Sukhwani, V., S. Deshkar and R. Shaw (2020) 'COVID-19 lockdown, food systems and urban-rural partnership: Case of Nagpur, India', *International Journal of Environmental Research and Public Health* **17**(16): 5710

Suleimany, M. (2021) 'Smart urban management and IoT; paradigm of e-governance and technologies in developing communities', *5th International Conference on Internet of Things and Applications (IoT)*, 19-20 May, Isfahan, Iran, pp. 1-6

Sumner, A., C. Hoy and E. Ortiz-Juarez (2020) *Estimates of the impact of COVID-19 on global poverty*, WIDER Working Paper 2020/43, UNU-Wider, Helsinki, https://www.wider.unu.edu/sites/default/files/Publications/Working-paper/PDF/wp2020-43.pdf, last accessed 23 April 2022

Sun, H. (2019) 'Grand challenges in environmental nanotechnology', *Frontiers in Nanotechnology* **1**(2): 1-3

Sundaresan, J. (2019) 'Urban planning in vernacular governance: Land use planning and violations in Bangalore, India', *Progress in Planning* **127**:1-23.

Suri, S. N. and F. Bonaglia (2021) 'Why local? Why now? Strengthening intermediary cities to achieve the SDGs', https://unhabitat.org/why-local-why-now-strengthening-intermediary-cities-to-achieve-the-sdgs, last accessed 25 April 2022

Surico, J. (2021) 'Informal transport must play a bigger role in post-pandemic recovery. Here's how that can happen', https://www.research.ox.ac.uk/article/2021-06-16-informal-transport-must-play-a-bigger-role-in-post-pandemic-recovery-here-s-how-that-can-happen, last accessed 19 March 2022

Surie, A. (2020) 'On-demand platforms and pricing: How platforms can impact the informal urban economy, evidence from Bengaluru, India', *Work Organisation, Labour & Globalisation* **14**(1): 83-100

Susskind, L. (2010) 'Responding to the risks posed by climate change: Cities have no choice but to adapt', *The Town Planning Review* **81**(3): 217-235

Sverdlik, A., D. Mitlin and D. Dodman (2019) *Realising the Multiple Benefits of Climate Resilience and Inclusive Development in Informal Settlements*, C40 Cities Climate Leadership Group, New York

Sverdlik, A. and A. Walnycki (2021) *Better Cities After COVID-19: Transformative Urban Recovery in the Global South*, IIED Issue Paper, International Institute for Environment and Development, London, http://pubs.iied.org/20241IIED, last accessed 7 June 2022

Sverdlik, A., J. Makau, J, Kimani, C. Mumbi, P. Njoroge, E. Otibine, K. Nyambuga, J. Wairutu and J. Waithaka (2020) *Achieving Scale, Social Inclusion, and Multifaceted Shelter Solutions*, International Institute for Environment and Development, Kenya, https://pubs.iied.org/sites/default/files/pdfs/migrate/10884IIED.pdf, last accessed 24 March 2022

Swain, M., E. McKinney and L. Susskind (2020) 'Water shutoffs in older American cities: Causes, extent, and remedies', *Journal of Planning Education and Research* :1–8, https://doi.org/10.1177/0739456X2090443, last accessed 10 June 2022

Swapan, M. S. H., and S. Khan (2021) 'Urban informality and parallel governance systems: shaping citizens' engagements in urban planning processes in Bangladesh, *International Planning Studies* **27**(1):1-17

Swart, R., W. Timmermans, J. Jonkhof and H. Goosen (2021) 'From urban façade to green foundation: Re-imagining the garden city to manage climate risks', *Urban Planning* **6**(4): 4-8

Tacoli, C. (2017) 'Food (in)security in rapidly urbanising, low-income contexts', *International Journal of Environmental Research and Public Health* **14**(12): 1554

Tainio, M., Z. J. Andersen, M. J. Nieuwenhuijsen, L. Hu, A. de Nazelle, R. An, L. M. T. Garcia, S. Goenka, B. Zapata-Diomedi, F. Bull and T.H. de Sá (2021) 'Air pollution, physical activity and health: A mapping review of the evidence', *Environment International* **147**: 105954

Talhami, M. and M. Zeitoun (2022) 'The impact of attacks on urban services II: Reverberating effects of damage to water and wastewater systems on infectious disease', *International Review of the Red Cross* **102**(915): 1293-1325, https://international-review.icrc.org/articles/impact-of-attacks-on-urban-services-ii-damage-to-wastewater-systems-infectious-disease-915#footnote43_h8syz25, last accessed 4 May 2022

Tanabe, M., E. Pearce and S. K. Krause (2018) '"Nothing about us, without us": Conducting participatory action research among and with persons with disabilities in humanitarian settings', *Action Research* **16**(3): 280-298

Tasan-Kok, T. and J. Vranken (2011) *Handbook for Multilevel Urban Governance in Europe. Analysing Participatory Instruments for an Integrated Urban Development*, European Urban Knowledge Network, The Hague, Netherlands

Termeer, C. J. A. M., A. Dewulf and G. R. Biesbroek (2017) 'Transformational change: Governance interventions for climate change adaptation from a continuous change perspective,' *Journal of Environmental Planning and Management* **60**(4): 558–576

The Climate Group (2022) 'Further, faster, together: Under2 leaders actions at COP26', , https://www.theclimategroup.org/further-faster-together-under2-leaders-actions-cop26, last accessed 22 May 2022

The Economist (2022) 'What will it cost to rebuild Ukraine?', *The Economist*, 16 April, https://www.economist.com/briefing/2022/04/16/what-will-it-cost-to-rebuild-ukraine, last accessed 24 May 2022

The Guardian (2021) 'The Guardian view on Amazon's shops: Benefit society, not just consumers', *The Guardian*, 10 October, https://www.theguardian.com/commentisfree/2021/oct/10/the-guardian-view-on-amazons-shops-benefit-society-not-just-consumers, last accessed 25 October 2021

The Hindu BusinessLine (2021) 'Ghaziabad issues India's first municipal green bonds', *The Hindu Business Line*, 8 April, https://www.thehindubusinessline.com/news/ghaziabad-issues-indias-first-municipal-green-bonds/article34271175.ece, last accessed 11 May 2022

The Independent Panel for Pandemic Preparedness and Response (2021) *COVID-19: Make it the Last Pandemic*, The Independent Panel for Pandemic Preparedness and Response, Geneva, https://theindependentpanel.org/mainreport/, last accessed 24 March 2022

The Lancet (2020) 'COVID-19: remaking the social contract', *Lancet* **395**(10234): 1401

The Lancet HIV (2019) 'Cities getting to 90-90-90 and beyond', *The Lancet HIV* **6**(10): e639, https://www.thelancet.com/journals/lanhiv/article/PIIS2352-3018(19)30299-1/fulltext, last accessed 24 March 2022

Thieme, T, A. (2016) *A Reflection on Resilient Urban Economies*, British Academy, United Kingdom, pp.1-17, https://www.thebritishacademy.ac.uk/documents/1881/Reflection-Resilient-Urban-Economies-Thieme.pdf, last accessed 2 March 2022

Thombre, A. and A. Agarwal (2021) 'A paradigm shift in urban mobility: Policy insights from travel before and after COVID-19 to seize the opportunity', *Transport Policy* **110**: 335–353

Todes, A. (2004) 'Regional planning and sustainability: Limits and potentials of South Africa's integrated development plans', *Journal of Environmental Planning and Management* **47**(6): 843–861

Tollefson, J. (2022) 'What the war in Ukraine means for energy, climate and food', *Nature,* 5 April, https://www.nature.com/articles/d41586-022-00969-9, last accessed 06 May 2022

Tozer, L., K. Hörschelmann, I. Anguelovski, H. Bulkeley and Y. Lazova (2020) 'Whose city? Whose nature? Towards inclusive nature-based solution governance', *Cities* **107**: 102892

Transformative Urban Mobility Initiative (TUMI) (2019) *Sustainable urban transport: Avoid-Shift-Improve (A-S-I)*, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Germany, https://www.transformative-mobility.org/assets/publications/ASI_TUMI_SUTP_iNUA_No-9_April-2019.pdf, last accessed 29 April 2022

Transport for London (2021a) *Implications of Reduced Funding for TfL*, Transport for London, London, https://board.tfl.gov.uk/documents/s16939/fc-20211124-item11a-Impacts-of-Reduced-Funding.pdf

Transport for London (2021b) 'Ultra low emissions zone', https://tfl.gov.uk/modes/driving/ultra-low-emission-zone, last accessed 11 May 2022

Trencher, G. (2019) 'Towards the smart city 2.0: Empirical evidence of using smartness as a tool for tackling social challenges', *Technological Forecasting and Social Change* **142**: 117-128

Tretter, E. M. (2016) *Shadows of a Sunbelt City: The Environment, Racism, and the Knowledge Economy in Austin*, University of Georgia Press, Georgia

Tribuna Economica (2019) 'Eurostat - downward trend in the share of persons at risk of poverty or social exclusion in the EU', *Tribuna Economica*,18 October, https://www.etribuna.com/eportale/en/33951-eurostat-downward-trend-in-the-share-of-persons-at-risk-of-poverty-or-social-exclusion-in-the-eu-2, last accessed 4 May 2022

Triveno, L. (2016) 'How Latin America's housing policies are changing the lives of urban families', *World Bank Blogs*, 11 April, https://blogs.worldbank.org/sustainablecities/how-latin-america-s-housing-policies-are-changing-lives-urban-families, last accessed 5 May 2022

Tsivanidis, N. (2018) *The Aggregate and Distributional Effects of Urban Transit Infrastructure: Evidence from Bogotá's TransMilenio*, Ph.D. Dissertation, University of Chicago Booth School of Business, Chicago

Tucker, J. and M. Anantharaman (2020) 'Informal Work and Sustainable Cities: From Formalization to Reparation', *One Earth* **3**(3): 290-299

Turnheim, B., F. Berkhout, F. Geels, A. Hof, A. McMeekin, B. Nykvist and D. van Vuuren (2015) 'Evaluating sustainability transitions pathways: Bridging analytical approaches to address governance challenges', *Global Environmental Change* **35**: 239-253

Tyszczuk, R. and J. Smith (2018) 'Culture and climate change scenarios: The role and potential of the arts and humanities in responding to the "1.5 degrees target"', *Current Opinion in Environmental Sustainability* **31**: 56-64

UCLG (United Cities and Local Governments) (2016) *Local and Regional Governments: Partners for the Global Agenda*, https://www.uclg cisdp.org/sites/default/files/folleto%20UN%20final%20web_1.pdf, last accessed 25 February 2022

UCLG (2019) *The Localization of the Global Agendas: How Local Action is Transforming Territories and Communities (GOLD V Report),* https://www.uclg.org/sites/default/files/goldv_en.pdf, last accessed 11 April 2022

UCLG (2021) *Towards the localization of the SDGs: Sustainable and Resilient Recovery Driven by Cities and Territories*, Local and Regional Governments' Report to the 2020 HLPF, 5th Report, https://www.uclg.org/sites/default/files/5th_report_gtf_hlpf_2021.pdf, last accessed 25 February 2022

UITP (International Association of Public Transport/ Union Internationale des Transports Publics) (2020a) 'Promoting safe and sustainable cities with public transport for the SDGs', https://www.uitp.org/publications/promoting-safe-and-sustainable-cities-with-public-transport-for-the-sdgs, last accessed 3 May 2022

UITP (2020b) 'Public transport is COVID-safe', https://www.uitp.org/publications/public-transport-is-covid-safe, last accessed 3 May 2022

UITP (2021) *Key Insights into Transforming the Informal Transport Sector*, UITP Knowledge Brief, https://cms.uitp.org/wp/wp-content/uploads/2021/02/Knowledge-Brief-Informal-transport.pdf, last accessed 19 March 2022

UN Women (2019) *Safe Cities and Safe Public Spaces for Women and Girls Global Flagship Initiative: International Compendium of Practice,* https://www.unwomen.org/en/digital-library/publications/2019/01/safe-cities-and-safe-public-spaces-international-compendium-of-practices, last accessed 19 March 2022

UNAIDS (Joint United Nations Programme on HIV and AIDS) (2019) *Cities on the Road to Success: Good Practices in the Fast-Track Cities Initiative to End AIDS,* https://www.unaids.org/sites/default/files/media_asset/cities-on-the-road-to-success_en.pdf, last accessed 24 March 2022

UNAIDS (2021) 'Global HIV & AIDS statistics — Fact sheet', Geneva, https://www.unaids.org/en/resources/fact-sheet , last accessed 9 May 2022

UNCDF (United Nations Capital Development Fund) (2020) *COVID-19 Emergency Response: Local Government Finance – Guidance Note for Immediate Action ,* Edition #4 https://www.uncdf.org/article/5477/guidance-note-covid19-local-governments, last accessed 25 February 2022

UNCTAD (United Nations Conference on Trade and Development) (2021a) 'Least developed countries suffer digital divide in mobile connectivity', https://unctad.org/topic/least-developed-countries/chart-april-2021, last accessed 27 September 2021

UNCTAD (2021b) 'Global e-commerce jumps to $26.7 trillion, COVID-19 boosts online sales', https://unctad.org/news/global-e-commerce-jumps-267-trillion-covid-19-boosts-online-sales, last accessed 8 November 2021

UNDESA (United Nations Department of Social and Economic Affairs) (2001) *The Components of Urban Growth in Developing Countries*, No. ESA/P/WP.169, UN Department of Economic and Social Affairs, New York

UNDESA (2014a) *Prototype Global Sustainable Development Report*, https://sustainabledevelopment.un.org/content/documents/1454Prototypeper cent20Globalper cent20SDper cent20Report2.pdf, last accessed 7 June 2022

UNDESA (2014b) 'Enabling youth civic engagement', https://www.un.org/development/desa/youth/enabling-youth-civic-engagement.html, last accessed 16 October 2021

UNDESA (2015) *World Population Prospects: The 2015 Revision, Key Findings and Advance Tables*, Working Paper No. ESA/P/WP.241, https://population.un.org/wpp/publications/files/key_findings_wpp_2015.pdf, last accessed 25 April 2022

UNDESA (2018a) *The World's Cities in 2018 – Data Booklet (ST/ESA/ SER.A/417)*, https://digitallibrary.un.org/record/3799524/files/the_worlds_cities_in_2018_data_booklet.pdf, last accessed 23 April 2022

UNDESA (2018b) 'Majority of the world's cities highly exposed to disasters, UN DESA warns on World Cities Day', https://www.un.org/development/desa/en/news/population/world-cities-day-2018.html, last accessed 5 May 2022

UNDESA (2019a) 'Publications: 2018 revision of world urbanization prospects', https://www.un.org/development/desa/publications/2018-revision-of-world-urbanization-prospects.html, last accessed 20 April 2022

UNDESA (2019b) *World Urbanization Prospects: The 2018 Revision,* United Nations, New York

UNDESA (2019c) *World Population Prospects*, UN Department of Economic and Social Affairs, New York

UNDESA (2020a) *E-Government survey 2020: Digital government in the decade of action for sustainable development*, UN Department of Economic and Social Affairs, New York

UNDESA (2020b) *World Social Report 2020: Inequality in a Rapidly Changing World,* https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/01/World-Social-Report-2020-Full-Report.pdf, last accessed 21 September 2020

UNDESA (2022) 'Ensure access to affordable, reliable, sustainable and modern energy for all', United Nations Sustainable Development Goals, https://sdgs.un.org/goals/goal7, last accessed 22 May 2022

UNDESA, UNCTAD, UNECA, UNECE, UNECLAC and UNESCWA (2021) *World Economic Situation Prospects,* United Nations, New York

UNDP (United Nations Development Programme) (2020) *Human Development Report 2020: The Next Frontier - Human Development and the Anthropocene*, United Nations Development Programme, New York

UNDP and OPHI (Oxford Poverty and Human Development Initiative) (2020) *Global Multidimensional Poverty Index 2020, Charting Pathways out of Multidimensional Poverty: Achieving the SDGs*, http://hdr.undp.org/sites/default/files/2020_mpi_report_en.pdf, last accessed 4 May 2022

UNDP and OPHI (2021) *Global Multidimensional Poverty Index 2021: Unmasking Disparities by Ethnicity, Caste, and Gender*, https://hdr.undp.org/sites/default/files/2021_mpi_report_en.pdf, last accessed 4 May 2022

UNDRR (United Nations Office for Disaster Risk Reduction) (2022) 'Making Cities Resilient 2030', https://mcr2030dashboard.undrr.org, last accessed 8 May 2022

UNECE (United Nations Economic Commission for Europe) (2019) *Regional Policy Brief on Building Urban Economic Resilience during and after COVID-19 in the UNECE Region*, https://unece.org/sites/default/files/2021-09/Regional%20Policy%20Brief%20-%20COVID%2019%20Resilient%20Cities.pdf, last accessed 3 May 2022

UNECE (2021a) 'Recovering from COVID-19: A sustainable and human-centred approach to the future of work', https://unece.org/economic-cooperation-and-integration/news/recovering-covid-19-sustainable-and-human-centred, last accessed 3 May 2022

UNECE (2021b) 'Safer streets for pedestrians and cyclists will boost Ethiopia's sustainable recovery, through joint action supported by UN Road Safety Fund', https://unece.org/media/press/358705, last accessed 20 April 2022

UNECOSOC (United Nations Economic and Social Council) (2019) *Special Edition: Progress Towards the Sustainable Development Goals*, Report of the Secretary-General, No. E/2019/68, UN Economic and Social Council, New York, https://unstats.un.org/sdgs/files/report/2019/secretary-general-sdg-report-2019--EN.pdf, last accessed 10 June 2022

UNECOSOC (2020) *Social Dimensions of the New Partnership for Africa's Development: Report of the Secretary-General*, No. E/CN.5/2021/2, UN Economic and Social Council, New York, https://digitallibrary.un.org/record/3929669/files/E_RES_2021_9-EN.pdf, last accessed 5 May 2022

UNECOSOC (2022) *Progress in the Implementation of the New Urban Agenda: Report of the Secretary General*, No. A/76/639–E/2022/10, UN Economic and Social Council, New York, https://documents-dds-ny.un.org/doc/UNDOC/GEN/N22/278/72/PDF/N2227872.pdf?OpenElement, last accessed 23 May 2022

UNEP (United Nations Environment Programme) (2016) *Green Energy Choices: The Benefits, Risks, and Trade-Offs of Low-Carbon Technologies for Electricity Production*, United Nations Environment Programme, Nairobi

UNEP (2019a) 'Business unusual: Four innovations to clear the air', https://www.unep.org/news-and-stories/story/business-unusual-four-innovations-clear-air, last accessed 8 November 2021

UNEP (2019b) 'District energy: A secret weapon for climate action and human health', https://www.unep.org/news-and-stories/story/district-energy-secret-weapon-climate-action-and-human-health, last accessed 15 November 2021

UNEP (2020a) 'Car-free days are taking hold in African cities', https://www.unep.org/news-and-stories/story/car-free-days-are-taking-hold-african-cities, last accessed 22 May 2022

UNEP (2020b) *Emissions Gap Report 2020,* https://www.unep.org/emissions-gap-report-2020, last accessed 29 April 2022

UNEP (2021a) *2021 Global Status Report for Buildings and Construction: Towards a Zero-emission, Efficient and Resilient Buildings and Construction Sector*, United Nations Environment Programme, Nairobi

UNEP (2021b) 'Cooling community announces steps to beat global warming with GBP 12 million boost from UK', https://www.unep.org/news-and-stories/press-release/cooling-community-announces-steps-beat-global-warming-gbp-12-million, last accessed 26 May 2022

UNEP (2021c) *Are We Building Back Better?: Evidence from 2020 and Pathways for Inclusive Green Recovery Spending*, https://wedocs.unep.org/bitstream/handle/20.500.11822/35281/AWBBB.pdf, last accessed 19 March 2022

UNEP (2021d) 'Pandemic caused dip in building emissions, but long-term outlook bleak – UN report', https://www.unep.org/news-and-stories/press-release/pandemic-caused-dip-building-emissions-long-term-outlook-bleak-un, last accessed 15 November 2021

UNEP (2021e) *Emissions Gap Report 2021: The Heat Is On – A World of Climate Promises Not Yet Delivered*, https://www.unep.org/resources/emissions-gap-report-2021, last accessed 29 April 2022

UNEP and UN-Habitat (2021) *Global Environment for Cities-GEO for Cities: Towards Green and Just Cities*, UNEP, Nairobi

UNESCAP (United Nations Economic Commission for Asia and Pacific) and UN-Habitat (2019) *The Future of Asian and Pacific Cities. Transformative Pathways Towards Sustainable Urban Development*, https://www.unescap.org/sites/default/d8files/knowledge-products/Future%20of%20AP%20Cities%20Report%202019.pdf, last accessed 3 May 2022

UNESCO (United Nations Educational, Scientific and Cultural Organization) (2016) *United Nations Water Report 2016: Water and Jobs*, UNESCO, Paris, https://unesdoc.unesco.org/ark: /48223/pf0000243938, last accessed 5 May 2022

UNESCO (2019) *The United Nations World Water Development Report 2019: Leaving No One Behind*, United Nations Educational, Scientific and Cultural Organization, Paris

UNESCO (2021) *Snapshots of Learning Cities' Responses to COVID-19*, United Nations Educational, Scientific and Cultural Organization Institute for Lifelong Learning, Hamburg, https://unesdoc.unesco.org/ark:/48223/pf0000378050

UNESCO and UN-Habitat (2009) *Urban Policies and the Right to the City: Rights, Responsibilities and Citizenship,* https://unesdoc.unesco.org/ark:/48223/pf0000178090, last accessed 10 June 2022

UNFCCC (United Nations Framework Convention on Climate Change) (2021a) 'Who's in?', https://racetozero.unfccc.int/join-the-race/whos-in, last accessed 6 June 2022

UNFCCC (2021b) 'Climate smart cities in emerging economies', https://unfccc.int/climate-action/momentum-for-change/activity-database/momentum-for-change-climate-smart-cities-in-emerging-economies, last accessed 11 October 2021

UN-Habitat (2007) *Enhancing Urban Safety and Security: Global Report on Human Settlements 2007*, Earthscan, London and Sterling, VA

UN-Habitat (2008) *State of the World's Cities Report*

2008/2009: Harmonious Cities, Earthscan, London and Sterling, VA
UN-Habitat (2009) *Global Report on Human Settlements 2009: Planning Sustainable Cities*, Earthscan, London and Sterling, VA
UN-Habitat (2010) *State of the World's Cities Report 2010: Bridging the Urban Divide*, Earthscan, London
UN-Habitat (2011a) *The Impact of The Global Financial Crisis on Housing Finance,* UN-Habitat, Nairobi
UN-Habitat (2011b) *Global Report on Human Settlements 2011: Cities and Climate Change*, Earthscan, London and Washington, DC
UN-Habitat (2013) *Planning and Design for Sustainable Urban Mobility: Global Report on Human Settlements 2013*, Routledge, USA and Canada, https://unhabitat.org/planning-and-design-for-sustainable-urban-mobility-global-report-on-human-settlements-2013, last accessed 29 April 2022
UN-Habitat (2014) *Urban Planning for City Leaders*, Second Edition, UN-Habitat, Nairobi, https://unhabitat.org/sites/default/files/download-manager-files/UN%20Habitat%20UPCL%2014-02624%20-%20Combine.pdf, last accessed 6 April 2022
UN-Habitat (2015a) *A New Strategy of Sustainable Neighbourhood Planning: Five Principles - Urban Planning Discussion Note 3*, UN-Habitat, Nairobi, https://unhabitat.org/a-new-strategy-of-sustainable-neighbourhood-planning-five-principles, last accessed 1 May 2022
UN-Habitat (2015b) *International Guidelines on Urban and Territorial Planning*, UN-Habitat, Nairobi
UN-Habitat (2016a) *World Cities Report 2016: Urbanization and Development – Emerging Futures*, UN-Habitat, Nairobi
UN-Habitat (2016b) *The Fundamentals of Urbanization: Evidence Base for Policy Making*, UN-Habitat, Nairobi
UN-Habitat (2016c) *Sustainable Development Goal 11,* https://www.local2030.org/library/60/SDG-Goal-11-Monitoring-Framework-A-guide-to-assist-national-and-local-governments-to-monitor-and-report-on-SDG-goal-11-indicators.pdf, last accessed 25 February 2022
UN-Habitat (2018a) *Leading Change: Delivering the New Urban Agenda through Urban and Territorial Planning*, UN-Habitat, Nairobi, https://unhabitat.org/sites/default/files/download-manager-files/Leadingper cent20Change_Webper cent20Versionper cent2001.02.18.pdf
UN-Habitat (2018b) *SDG Indicator 11.3.1 Training Module: Land Use Efficiency*, UN-Habitat, Nairobi
UN-Habitat (2018c) *Kuala Lumpur Declaration on Cities 2030*, https://unhabitat.org/sites/default/files/2018/04/Agenda-10-WUF9-KL-Declaration-English-1.pdf, last accessed 4 May 2022
UN-Habitat (2018d) *The Ninth Session of the World Urban Forum. Cities 2030: Cities for All – Implementing the New Urban Agenda*, Kuala Lumpur, Malaysia, https://unhabitat.org/sites/default/files/documents/2019-05/wuf9-report-may-2019_10.pdf, last accessed 25 February 2022
UN-Habitat (2019a) *Progress in the implementation of the New Urban Agenda and the 2030 Agenda for Sustainable Development: Report of the Executive Director,* No. HSP/HA/1/1, UN-Habitat, Nairobi, https://unhabitat.org/sites/default/files/2019/05/hsp_ha_1_4_e.pdf, last accessed 6 April 2022
UN-Habitat (2019b) *The Strategic Plan* 2020–2023, UN-Habitat, Nairobi, https://unhabitat.org/sites/default/files/documents/2019-09/strategic_plan_2020-2023.pdf, last accessed 6 April 2022
UN-Habitat (2019c) *Urban Crises and the Informal Economy: Surviving ,Managing, Thriving in Post-Conflict Cities,* https://unhabitat.org/sites/default/files/documents/2020-02/urban_crises_and_the_informal.pdf, last accessed 4 May 2022
UN-Habitat (2020a) *World Cities Report 2020: The Value of Sustainable Urbanization*, UN-Habitat, Nairobi
UN-Habitat (2020b) *UN-Habitat Sub-Saharan Africa Atlas*, UN-Habitat, Nairobi, https://unhabitat.org/sites/default/files/2020/07/atlasroaf_v02_final-compressed.pdf, last accessed 6 April 2022
UN-Habitat (2020c) *COVID-19 in African Cities: Impacts, Responses and Policies Recommendations,* UN-Habitat, Nairobi
UN-Habitat (2020d) *The New Urban Agenda Illustrated*, UN-Habitat, Nairobi
UN-Habitat (2020e) 'New roads for Old Accra', https://www.mypsup.org/Ghana_Story_Details, last accessed 8 May 2022
UN-Habitat (2020f) 'Opinion: COVID-19 demonstrates urgent need for cities to prepare for pandemics', https://unhabitat.org/opinion-covid-19-demonstrates-urgent-need-for-cities-to-prepare-for-pandemics, last accessed 25 February 2022
UN-Habitat (2020g) *Future Cities, New Economy, and Shared City Prosperity Driven by Technological Innovations*, UN-Habitat, Nairobi, https://unhabitat.org/sites/default/files/2020/02/future_cities_new_economy_and_shared_city_prosperity_driven_by_technological_innovations_discussion_papers.pdf
UN-Habitat (2020h) *The Role of National Urban Forums as Multi-stakeholder Platforms to Accelerate Implementation of the Sustainable Development Goals and the New Urban Agenda: Report on the Expert Group Meeting, October 2020* Nairobi, Kenya, https://unhabitat.org/the-role-of-national-urban-forums-as-multi-stakeholder-platforms-to-accelerate-implementation-of, last accessed 25 February 2022
UN-Habitat (2020i) 'UN-Habitat's COVID-19 response plan', https://unhabitat.org/un-habitat-covid-19-response-plan, last accessed 1 May 2022
UN-Habitat (2020j) '45 cities to endorse digital rights', https://unhabitat.org/story-45-cities-to-endorse-digital-rights, last accessed 30 October 2021
UN-Habitat (2020k) *Governance Assessment Framework for Metropolitan, Territorial and Regional Management (GAF-MTR)*, Nairobi, Kenya, https://unhabitat.org/sites/default/files/2020/10/gaf-mtr.pdf, last accessed 25 February 2022
UN-Habitat (2021a) *Cities and Pandemics: Towards a More Just, Green and Healthy Future*, https://unhabitat.org/sites/default/files/2021/03/cities_and_pandemics-towards_a_more_just_green_and_healthy_future_un-habitat_2021.pdf, last accessed 3 April 2022
UN-Habitat (2021b) *Sustainable Urbanization for Sustaining Peace: UN-Habitat's contribution, experiences and added value in addressing and preventing urban crises in the Arab region,* https://unhabitat.org/sites/default/files/2021/05/sustainable_urbanization_for_sustaining_peace_in_the_arab_region_29.03.2021.pdf, last accessed 28 April 2022
UN-Habitat (2021c) 'UN-Habitat and University of Michigan assess Colombia's legal and policy frameworks', https://unhabitat.org/un-habitat-and-university-of-michigan-assess-colombia%E2%80%99s-legal-and-policy-frameworks, last accessed 13 May 2022
UN-Habitat (2021d) *A Guide: Leveraging Multi-Level Governance Approaches to Promote Health Equity,* https://unhabitat.org/a-guide-leveraging-multi-level-governance-approaches-to-promote-health-equity, last accessed 25 February 2022
UN-Habitat (2021e) *Addressing the Digital Divide: Taking Action towards Digital Inclusion*, https://unhabitat.org/sites/default/files/2021/11/addressing_the_digital_divide.pdf, last accessed 7 June 2022
UN-Habitat (2021f) *Assessing the Digital Divide: Understanding Internet Connectivity and Digital Literacy in Cities and Communities*, https://unhabitat.org/sites/default/files/2021/11/assessing_the_digital_divide.pdf, last accessed 7 June 2022
UN-Habitat (2021g) *Centering People in Smart Cities: A Playbook for Local and Regional Governments*, https://unhabitat.org/sites/default/files/2021/11/centering_people_in_smart_cities.pdf, last accessed 7 June 2022
UN-Habitat (2021h) *Compendium of Inspiring Practices: SDG focus,* Nairobi, Kenya, https://unhabitat.org/compendium-of-inspiring-practices-sdg-focus-03, last accessed 25 February 2022
UN-Habitat (2021i) 'Urban population trends', https://data.unhabitat.org/pages/urban-population-and-demographic-trends, last accessed 2 May 2022
UN-Habitat (2022a) *Implementation of the New Urban Agenda in the Latin America and the Caribbean*, https://www.urbanagendaplatform.org/node/2018, last accessed 25 February 2022
UN-Habitat (2022b) 'UN-Habitat expands COVID-19 prevention in Kenya's Mathare and Kibera informal settlements', https://unhabitat.org/un-habitat-expands-covid-19-prevention-in-kenyas-mathare-and-kibera-informal-settlements, last accessed 2 May 2022
UN-Habitat and DimSUR (2020) *CityRAP Tool: City Resilience Action Planning Tool,* UN-Habitat and Disaster Risk Management, Sustainability and Urban Resilience (DiMSUR), Nairobi, https://unhabitat.org/sites/default/files/2020/05/cityrap_tool_booklet_2020.pdf, last accessed 3 May 2022
UN-Habitat and Global Utmaning (2021) *HerCity: A Guide for Cities to Sustainable and Inclusive Urban Planning and Design Together with Girls*, UN-Habitat and Global Utmaning, Nairobi and Stockholm
UN-Habitat and UNCDF (2021) *Global Compendium of Practices on Local Economic and Financial Recovery: Building Urban Economic Resilience during and after COVID-19,* https://unhabitat.org/sites/default/files/2021/03/global-compendium-of-practices-covid-19.pdf, last accessed 3 May 2022
UN-Habitat and WHO (2020) *Integrating Health in Urban and Territorial Planning: A Sourcebook for Urban Leaders, Health and Planning Professionals,* https://unhabitat.org/integrating-health-in-urban-and-territorial-planning-a-sourcebook-for-urban-leaders-health-and, last accessed 24 March 2022
UN-Habitat, EC, EIB and IGC (2021) *Financing Sustainable Urban Development*, UN-Habitat, Nairobi
UN-Habitat, UNIDO and Government of Mexico (2021) *Prospective Territorial-Industrial Atlas for Investment Attraction: High-potential industries in Mexico*, https://publicacionesonuhabitat.org/onuhabitatmexico/Resumen-Atlas_ENG.pdf, last accessed 17 May 2022
UN-Habitat Youth (2020) 'Youth-led coalition against COVID-19 releases call to action', https://www.unhabitatyouth.org/youth-led-coalition-against-covid-19-releases-call-to-action, last accessed 25 February 2022
UNHRC (United Nations Human Rights Council) (2021) *A/HRC/39/29: The Right to Privacy in The Digital Age: Report of the United Nations High Commissioner for Human Rights*, United Nations Human Rights Council, Geneva, https://undocs.org/A/HRC/39/29, last accessed 20 October 2021
UNICEF (United Nations Children's Fund) (2018) *Advantage or Paradox? The Challenge for Children and Young People of Growing Up Urban*, https://data.unicef.org/resources/urban-paradox-report, last accessed 22 March 2022
UNICEF (2020) *Snapshot of Global and Regional Urban Water, Sanitation and Hygiene Inequalities*, United Nations International Children's Emergency Fund, New York
UNICEF, UN-Habitat and Ministry of Foreign Affairs of the Netherlands (2020) *Analysis Report: Analysis of Multiple Deprivations in Secondary Cities in Sub-Saharan Africa,* https://www.unicef.org/esa/media/5561/file/Analysis%20of%20Multiple%20Deprivations%20in%20Secondary%20Cities%20-%20Analysis%20Report.pdf, last accessed 6 April 2022

United Nations (2014) *Effective governance, policy making and planning for sustainable urbanization: Report of the Secretary-General,* Economic and Social Council, New York, https://www.un.org/ga/search/view_doc.asp?symbol=E/2014/67, last accessed 25 February 2022

United Nations (2015a) 'Transforming Our World: The 2030 Agenda for Sustainable Development', https://sdgs.un.org/2030agenda, last accessed 24 March 2022

United Nations (2015b) *Sendai Framework for Disaster Risk Reduction 2015-2030,* https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030, last accessed 25 February 2022

United Nations (2017) *New Urban Agenda, Resolution adopted by the General Assembly on 23 December 2016*, No. A/RES/71/256, United Nations, New York, https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_71_256.pdf, last accessed 30 October 2021

United Nations (2020a) *Policy Brief on COVID-19 in an Urban World*, https://www.un.org/sites/un2.un.org/files/sg_policy_brief_covid_urban_world_july_2020.pdf, last accessed 23 March 2022

United Nations (2020b) *Policy Brief: COVID-19 and Universal Health Coverage*, https://unsdg.un.org/sites/default/files/2020-10/SG-Policy-Brief-on-Universal-Health-Coverage_English.pdf, last accessed 6 May 2022

United Nations (2020c) *Report of the Secretary-General: Roadmap for Digital Cooperation*, https://www.un.org/en/content/digital-cooperation-roadmap/assets/pdf/Roadmap_for_Digital_Cooperation_EN.pdf, last accessed 13 October 2021

United Nations (2020d) *The Sustainable Development Goals Report 2020,* https://www.un.org/en/file/81908/download?token=BfviFhNa, last accessed 5 May 2022

United Nations (2021a) *Our Common Agenda – Report of the Secretary-General*, https://www.un.org/en/content/common-agenda-report/assets/pdf/Common_Agenda_Report_English.pdf, last accessed 24 March 2022

United Nations (2021b) *World Economic Situation Prospects,* https://www.un.org/development/desa/dpad/publication/world-economic- situation-and-prospects-2021/, last accessed 3 May 2022

United Nations (2021c) *The Sustainable Development Goals Report 2021,* https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021.pdf, last accessed 25 May 2022

United Nations (2021d) 'Leave no one behind: A people-centered approach to achieve meaningful connectivity', https://www.un.org/technologybank/news/leave-no-one-behind-people-centered-approach-achieve-meaningful-connectivity, last accessed 25 April 2022

United Nations (2022a) *Financing for Sustainable Development Report 2022: Inter-agency Task Force on Financing for Development*, United Nations Inter-Agency Task Force on Financing for Development, New York

United Nations (2022b) 'Ukraine war squeezes food supplies, drives up prices, threatens vulnerable nations', *UN News*,13 May, https://news.un.org/en/story/2022/05/1118172, last accessed 14 May 2022

United Nations (2022c) *Global Impact of War in Ukraine on Food, Energy and Finance Systems,* UN Brief No.1, https://news.un.org/pages/wp-content/uploads/2022/04/UN-GCRG-Brief-1.pdf, last accessed 24 May 2022

United Nations High Commissioner for Human Rights (2020) 'COVID-19 guidance note: Prohibition of evictions', https://www.ohchr.org/Documents/Issues/Housing/SR_housing_COVID-19_guidance_evictions.pdf, last accessed 25 February 2022

United Nations University (2020) 'The importance of decentralized development cooperation for migrants in a post-pandemic world', https://cpr.unu.edu/publications/articles/the-importance-of-decentralized-development-cooperation-for-migrants-in-a-post-pandemic-world.html, last accessed 25 February 2022

United States Census Bureau (2021) *The Supplemental Poverty Measure: 2020,* Report No. P60-275, United States Census Bureau, Maryland, https://www.census.gov/library/publications/2021/demo/p60-275.html, last accessed 6 May 2022

United States Census Bureau (2022) 'Over two-thirds of the nation's counties had natural decrease in 2021 (Release No. CB22-51)', https://www.census.gov/newsroom/press-releases/2022/population-estimates-counties-decrease.html, last accessed 6 May 2022

Université de Montréal (2018) *Montréal Declaration for Responsible AI*, https://www.montrealdeclaration-responsibleai.com/the-declaration, last accessed 20 May 2022

Unnikrishnan, H. and H. Nagendra (2021) 'Building climate resilient cities in the Global South: Assessing city adaptation plans in India', *The Round Table* **110**(5): 575-586, https://doi.org/10.1080/00358533.2021.1985268, last accessed 19 March 2022

Unnikrishnan, H., V. Castán Broto and H. Nagendra (2020) 'Commons - producing collaborative sustainable urban development: Experiences of water management in Bangalore, India', in J. Metzger and J. Lindblad (eds) *Dilemmas of Sustainable Urban Development: A View from Practice*, 1st Edition, Routledge, United Kingdom, pp. 201-216

UNRISD (United Nations Research Institute for Social Development) (2016) *The Human Rights-Based Approach to Social Protection*, Issue Brief, No.2, https://cdn.unrisd.org/assets/library/briefs/pdf-files/ib2-human-rights-based-approach.pdf, last accessed 5 May 2022

Urban Europe (2020) 'Europe Towards Positive Energy: A compilation of projects towards sustainable urbanization and the energy transition', Vienna, https://jpi-urbaneurope.eu/wp-content/uploads/2020/06/PED-Booklet-Update-Feb-2020_2.pdf, last accessed 23 May 2022

Urdal, H. (2004) *The Devil in the Demographics: The Effect of Youth Bulges on Domestic Armed Conflicts, 1950- 2000*, Social Development Papers: Conflict Prevention and Reconstruction Series, Working Paper No. 14, World Bank, Washington, DC

Urdal, H., and K. Hoelscher (2009) *Urban Youth Bulges and Social Disorder: An Empirical Study of Asian and Sub-Saharan African Cities*, World Bank, Washington, DC, https://doi.org/10.1596/1813-9450-5110, last accessed 6 April 2022

Vailshery, L. S., M. Jaganmohan and H. Nagendra (2013) 'Effect of street trees on microclimate and air pollution in a tropical city', *Urban Forestry & Urban Greening* **12**(3): 408-415

Valencia, S. C., D. Simon, S. Croese, A. Davison, K. Diprose, A. K. Srinivas, J. Nesprias, J. Nordqvist, M. Oloko, T. Sharma, N. Taylor Buck and I. Versace (2021) 'Urban climate resilience and its link to global sustainability agendas', in R. C. Brears (ed) *The Palgrave Handbook of Climate Resilient Societies*, Palgrave Macmillan, Cham, pp. 1-28

Valencia, S. C., D. Simon, S. Croese, J. Nordqvist, M. Oloko, T. Sharma, B. Taylor Buck and N. Versace, I. (2019) 'Adapting the sustainable development goals and the new urban agenda to the city level: Initial reflections from a comparative research project', *International Journal of Urban Sustainable Development* **11**(1): 4-23

Valenzuela-Fuentes, K., E. Alarcón-Barrueto and R. Torres-Salinas (2021) 'From resistance to creation: socio-environmental activism in Chile's "sacrifice zones"', *Sustainability* **13**(6): 3481

Valenzuela-Levi, N. (2021) 'The written and unwritten rules of internet exclusion: inequality, institutions and network disadvantage in cities of the Global South', *Information, Communication & Society* **24**(11): 1568-1585

van den Bosch, M. and Å. O. Sang (2017) 'Urban natural environments as nature-based solutions for improved public health – a systematic review of reviews', *Environmental Research* **158**: 373-384

van Deursen, A. J. and E. J. Helsper (2018) 'Collateral benefits of Internet use: Explaining the diverse outcomes of engaging with the Internet', *New Media & Society* **20**(7): 2333-2351

van Dijk, J. (2020) 'Closing the digital divide: the role of digital technologies on social development, well-being of all and the approach of the covid-19 pandemic', *in Virtual Expert Group UN Meeting on "Socially just transition towards sustainable development: The role of digital technologies on social development and well-being of all*, United Nations, New York, https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/07/Closing-the-Digital-Divide-by-Jan-A.G.M-van-Dijk-.pdf, last accessed 27 September 2021

van Hall, R. L., L. H. Cammeraat, S. D. Keesstra and M. Zorn (2017) 'Impact of secondary vegetation succession on soil quality in a humid Mediterranean landscape', *Catena* **149**: 836-843

van Lente, H., T. Swierstra and P. Joly (2017) 'Responsible innovation as a critique of technology assessment', *Journal of Responsible Innovation* **4**(2): 254-261

van Noordt, C. and G. Misuraca (2019) 'New Wine in Old Bottles: Chatbots in Government', in P. Panagiotopoulos, N. Edelmann, O. Glassey, G. Misuraca, P. Perycak, T. Lampoltshammer and B. Re (eds) *Electronic Participation: ePart 2019,* pp. 49-59

van Rensburg, N., A. N. Matheri and J. Meyer (2019) 'Bridging the Digital Divide in an African Smart City', *5th IEEE International Smart Cities Conference ISC2 2019,* pp. 518-526

van Vliet-Brown, C. E., S. Shahram and N. D. Oelke (2018) 'Health in All Policies utilization by municipal governments: Scoping review', *Health Promotion International* **33**(4): 713-722

Venables, A. J. (2015) *Making Cities Work for Development*, International Growth Centre, Growth Brief Series, No. 002, IGC, London

Venkateswaran, R. K. (2014) 'Municipal financial management', in C. D. Farvacque-Vitkovic and M. Kopanyi (eds) *Municipal Finances: A Handbook for Local Governments,* World Bank, Washington, DC

Venter, Z. S., K. Aunan, S. Chowdhury and J. Lelieveld (2020) 'COVID-19 lockdowns cause global air pollution declines', *Proceedings of the National Academy of Sciences*, **117**(32): 18984–18990

Vila, R., E. Estevez and P. R. Fillottrani (2018) 'The design and use of dashboards for driving decision-making in the public sector', in *Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV '18)*, pp. 382–388

Viola, C. O. (2020) 'The future of water: How innovations will advance water sustainability and resilience worldwide', *World Bank Blogs*, 15 June, https://blogs.worldbank.org/water/future-water-how-innovations-will-advance-water-sustainability-and-resilience-worldwide, last accessed 8 November 2021

Vilcu, I., L. Probst, B. Dorjsuren and I. Mathauer (2016) 'Subsidized health insurance coverage of people in the informal sector and vulnerable population groups: Trends in institutional design in Asia', *International Journal for Equity in Health*, **15**(1): 1-29

Vojnovic, I., A. L. Pearson, G. Asiki, G. DeVerteuil and A. Allen (2019) 'Global urban health: Inequalities, vulnerabilities, and challenges in the 21st century' in I. Vojnovic, A.L. Pearson, G. Asiki, G. DeVerteuil and A. Allen (eds) *Handbook of Global Urban Health*, Routledge, New York, pp. 1-32

Volans (2020) *Procuring a Regenerative Economy: The Critical Role of Sourcing in Generating the Future We Want*, Volans Ventures Ltd, London, https://volans.com/wp-content/uploads/2020/01/Procuring-a-Regenerative-Economy-FINAL.pdf, last accessed 19 March 2022

Vollset, S. E., E. Goren, C. Yuan, J. Cao, A. E. Smith, T. Hsiao, C. Bisignano, G. S. Azhar, E. Castro, J. Chalek, A. J. Dolgert, T. Frank, K. Fukutaki, S. I. Hay, R. Lozano, A. H. Mokdad, V. Nandakumar, M. Pierce, M. Pletcher, T. Robalik, K. M. Steuben, H. Y. Wunrow, B. S. Zlavog and C. J. L. Murray (2020) 'Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2100: A forecasting analysis for the global burden of disease study', *The Lancet* **396**(10258): 1285-1306 https://doi.org/10.1016/S0140-6736(20)30677-2, last accessed 7 April 2022

Wade, L. (2020) 'An unequal blow', *Science* **368**(6492): 700–703

Wahba, S., M. M. Sharif, M. Mizutori and L. Sorkin (2020) 'Cities are on the front lines of COVID-19', *World Bank Blogs*, 12 May, https://blogs.worldbank.org/sustainablecities/cities-are-front-lines-covid-19, last accessed 3 May 2022

Wahl, B., S. Lehtimaki, S. Germann and N. Schwalbe (2020) 'Expanding the use of community health workers in urban settings: A potential strategy for progress towards universal health coverage', *Health Policy and Planning* **35**(1): 91-101

Walker, W. E., V. A. Marchau and D. Swanson (2010) 'Addressing deep uncertainty using adaptive policies: Introduction to section 2', *Technological Forecasting and Social Change* **77**(6): 917-923

Walling, D., R. Sadler and D. Lafreniere (2021) 'Lessons from U.S. rust belt cities for equitable low-growth futures', *Urban Research & Practice* **14**(4): 471-482

Wang, D., T. Zhou and M. Wang (2021) 'Information and communication technology (ICT), digital divide and urbanization: Evidence from Chinese cities', *Technology in Society* **64**: 101516

Wang, H. and A. Rodríguez-Pose (2021) 'Local institutions and pandemics: City autonomy and the Black Death', *Applied Geography* **136**(3):102582

Wang, H. and R. B. Noland (2021) 'Bikeshare and subway ridership changes during the COVID-19 pandemic in New York City', *Transport Policy* **106**: 262–270

Wang, J, C. Wang and Y. Zhang (2020) 'Four decades of poverty and consumption in China', *The Singapore Economic Review* **65**(Supp 1): 117-138

Wang, M. L. and M. Otis (2019) 'Improving access to healthy food in cities', in S. Galea, C. K. Ettman and D. Vlahov (eds) *Urban Health*, Oxford University Press, Oxford, pp. 148-155

Warner, J. F. and H. Wiegel (2021) 'Displacement induced by climate change adaptation: The case of 'climate buffer' infrastructure', *Sustainability* **13**(16): 9160

Watson, J., A. S. Yazbeck and L. Hartel (2021) 'Making health insurance pro-poor: Lessons from 20 developing countries', *Health Systems & Reform* **7**(2): e1917092

Watson, V. (2009) '"The planned city sweeps the poor away…': urban planning and 21st century urbanisation', *Progress in Planning* **72**(3): 151-193

Watson, V. (2014) 'African urban fantasies: Dreams or nightmares?' *Environment and Urbanization* **26**(1): 215-231

Watson, V. (2014) 'Co-production and collaboration in planning–The difference', *Planning Theory & Practice* **15**(1): 62-76

Watt, P. (2017) 'Social housing and urban renewal', in P. Watt and P. Smets (eds) *Social Housing and Urban Renewal: A Cross-National Perspective*, Emerald Publishing, Bingley, pp. 1-36

Weiss, L. M. (2014) 'Informal settlements and urban heritage landscapes in South Africa', *Journal of Social Archaeology* **14**(1): 3-25

Wellcome Trust (2021) 'Wellcome Global Monitor 2020: Covid-19,' https://cms.wellcome.org/sites/default/files/2021-11/wgm-public-file-covid-cross-tabs.xlsx, last accessed 25 February 2022

West, P. (2019) 'The Whitemosphere': unsettling Western design epistemes through Indigenous sovereignty and the racialized logics of whiteness', in *Proceedings of the 2019 Australian Council of Art and Design Conference: Engagement (ACUADS 2019)*, RMIT University, pp. 1-11

West, S., A. Castro Baker, S. Samra and E. Coltrera (2021) *Stockton Economic Empowerment Demonstration, Preliminary Analysis: SEED's First Year*, SEED, Stockton, https://static1.squarespace.com/static/6039d612b17d055cac14070f/t/6050294a1212aa40fdaf773a/1615866187890/SEED_Preliminary+Analysis-SEEDs+First+Year_Final+Report_Individual+Pages+.pdf, last accessed 8 November 2021

Westbury, S., I. Ghosh, H. M. Jones, D. Mensah, F. Samuel, A. Irache, N. Azhar, L. Al-Khudairy, R. Iqbal and O. Oyebode (2021) 'The influence of the urban food environment on diet, nutrition and health outcomes in low-income and middle-income countries: A systematic review', *BMJ Global Health* **6**(10): e006358

WFP (World Food Programme) (2020) *Social Protection and Covid-19 in Urban and Rural Settings – 2020,* https://docs.wfp.org/api/documents/WFP-0000123459/download, last accessed 5 May 2022

Whitehead, M. (1992) 'The concepts and principles of equity and health', *International Journal of Health Services* **22**(3): 429–45

Whitney, C. R. (1973) '4 European countries and West Berlin spend a car-free Sunday', *The New York Times*, 26 November, https://www.nytimes.com/1973/11/26/archives/4-european-countries-and-west-berlin-spend-a-carfree-sunday-berlin.html?smid=url-share, last accessed 22 May 2022

Whittlestone, J., R. Nyrup, A. Alexandrova, K. Dihal and S. Cave (2019) *Ethical and Societal Implications of Algorithms, Data, And Artificial Intelligence: A Roadmap for Research*, Nuffield Foundation, London

WHO (World Health Organization) (2015) *Health in All Policies: Training Manual,* https://www.who.int/publications-detail-redirect/9789241507981, last accessed 24 March 2022

WHO (2016) *Burning Opportunity: Clean Household Energy for Health, Sustainable Development, and Wellbeing of Women and Children*, World Health Organization, Geneva, https://www.who.int/publications/i/item/burning-opportunity-clean-household-energy-for-health-sustainable-development-and-wellbeing-of-women-and-children, last accessed 24 March 2022

WHO (2018a) *Air Pollution and Child Health: Prescribing Clean Air*, https://www.who.int/publications/i/item/air-pollution-and-child-health, last accessed 19 March 2022

WHO (2018b) *Global Status Report on Road Safety 2018*, World Health Organization, Geneva, https://www.who.int/publications/i/item/9789241565684, last accessed 24 March 2022

WHO (2018c) '9 out of 10 people worldwide breathe polluted air, but more countries are taking action', https://www.who.int/news/item/02-05-2018-9-out-of-10-people-worldwide-breathe-polluted-air-but-more-countries-are-taking-action, last accessed 8 November 2021

WHO (2020) 'The top 10 causes of death', https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death, last accessed 10 May 2022

WHO (2021a) *Building Health Systems Resilience for Universal Health Coverage and Health Security During the COVID-19 Pandemic and Beyond*, WHO Position Paper, No. WHO/UHL/PHC-SP/2021.01, https://www.who.int/publications/i/item/WHO-UHL-PHC-SP-2021.01, last accessed 24 March 2022

WHO (2021b) 'Universal Health Coverage (UHC)', https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-(uhc), last accessed 11 April 2022

WHO (2021c) 'COVID-19 and the social determinants of health and health inequity: Evidence Brief', Geneva, https://www.who.int/publications/i/item/9789240038387, last accessed 19 March 2022

WHO (2021d) 'Dementia care at home: Telemedicine assessments for dementia patients', https://www.who.int/publications/m/item/dementia-care-at-home-telemedicine-assessments-for-dementia-patients, last accessed 10 May 2022

WHO (2021e) 'Global leaders unite in urgent call for international pandemic treaty', https://www.who.int/news/item/30-03-2021-global-leaders-unite-in-urgent-call-for-international-pandemic-treaty, last accessed 6 May 2022

WHO (2021f) 'Road traffic injuries', https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries, last accessed 30 April 2022

WHO (2021g) 'What are the WHO Air quality guidelines? Improving health by reducing air pollution', https://www.who.int/news-room/feature-stories/detail/what-are-the-who-air-quality-guidelines, last accessed 24 March 2022

WHO (2021h) *WHO Global Air Quality Guidelines: Particulate Matter (And), Ozone, Nitrogen Dioxide, Sulfur Dioxide And Carbon Monoxide*, https://apps.who.int/iris/bitstream/handle/10665/345329/9789240034228-eng.pdf?sequence=1&isAllowed=y, last accessed 24 March 2022

WHO (2022a) 'Besiktas municipality's social centers', https://extranet.who.int/agefriendlyworld/afp/besiktas-municipalitys-social-centers, last accessed 9 May 2022

WHO (2022b) 'Bio-healthy parks', https://extranet.who.int/agefriendlyworld/afp/bio-healthy-parks, last accessed 9 May 2022

WHO (2022c) 'Committed to becoming more age friendly', Geneva, https://extranet.who.int/agefriendlyworld/network/manchester, last accessed 9 May 2022

WHO (2022d) 'Constitution', https://www.who.int/about/governance/constitution, last accessed 22 March 2022

WHO (2022e) 'Measles – Afghanistan', https://www.who.int/emergencies/disease-outbreak-news/item/measles-afghanistan, last accessed 4 May 2022

WHO (undated) 'Air pollution', https://www.who.int/health-topics/air-pollution#tab=tab_1, last accessed 11 May 2022

WHO and IBRD/World Bank (2021) *Tracking Universal Health Coverage: 2021 Global Monitoring Report*, https://www.who.int/publications/i/item/9789240040618, last accessed 24 March 2022

WHO and UN-Habitat (2016) *Global Report on Urban Health: Equitable, Healthier Cities for Sustainable Development*, https://apps.who.int/iris/handle/10665/204715, last accessed 24 March 2022

WHO and UNICEF (2021) *Progress on Household Drinking Water, Sanitation and Hygiene 2000-2020: Five Years into the SDGs*, https://reliefweb.int/sites/reliefweb.int/files/resources/JMP-2021-progress-report.pdf, last accessed 11 April 2022

WHO Regional Office for Europe (2019) *A Multilevel Governance Approach to Preventing and Managing Noncommunicable Diseases: The Role of Cities and Urban Settings*, https://www.euro.who.int/__data/assets/pdf_file/0007/397789/Cities-and-NCDs.pdf, last accessed 24 March 2022

WHO Regional Office for Europe (2022) 'Healthy cities vision', https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/who-european-healthy-cities-network/healthy-cities-vision, last accessed 22 March 2022

WHO Rwanda (2020) 'COVID-19 response in Rwanda: Use of drones in community awareness', https://www.afro.who.int/news/covid-19-response-

rwanda-use-drones-community-awareness, last accessed 24 March 2022
Whyte, K. (2021) 'Experts: Why does 'climate justice' matter?', *Carbon Brief*, 7 October, https://www.carbonbrief.org/experts-why-does-climate-justice-matter, last accessed 19 March 2022
Wielemaker, R., J. Stuiver, G. Zeeman and J. Weijma (2020) 'Identifying Amsterdam's nutrient hotspots: a new method to map human excreta at building and neighborhood scale', *Journal of Industrial Ecology* **24**(3): 473-484
Wijngaarde, I., J. Vinanchiarachi and J. Readman (2021) 'Universal Basic Income (UBI) for reducing inequalities and increasing socio-economic inclusion: A proposal for a new sustained policy perspective', in H. Kury and S. Redo (eds) *Crime Prevention and Justice in 2030*, Springer, Netherlands
Wilkinson, A. (2020) 'Local response in health emergencies: key considerations for addressing the COVID-19 pandemic in informal urban settlements', *Environment and Urbanization* **32**(2): 503-522
Willett, W., J. Rockström, B. Loken, M. Springmann, T. Lang, S. Vermeulen, T. Garnett, D. Tilman, F. DeClerck, A. Wood, M. Jonell, M. Clark, L. J. Gordon, J. Fanzo, C. Hawkes, R. Zurayk, J. A. Rivera, W. De Vries, L. M. Sibanda, A. Afshin, A. Chaudhary, M. Herrero, R. Augustina, F. Branca, A. Lartey, S. Fan, B. Crona, E. Fox, V. Bignet, M. Troell, T. Lindahl, S. Singh, S. E. Cornell. K. S. Reddy, S. Narain, S. Nishtar and C. J. L. Murray (2019) 'Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems', *The Lancet* **393**(10170): 447-492
Williams, D. R., J. A. Lawrence and B.A. Davis (2019) 'Racism and health: Evidence and needed research', *Annual Review of Public Health* **40**: 105-125
Williams, G., B. V. Thampi, D. Narayana, S. Nandigama and D. Bhattacharyya (2011) 'Performing participatory citizenship– Politics and power in Kerala's Kudumbashree programme', *Journal of Development Studies* **47**(8):1261-1280
Williams, G., J. Devika and G. Aandahl (2015) 'Making space for women in urban governance? Leadership and claims-making in a Kerala slum', *Environment and Planning A* **47**(5): 1113-1131
Williams, G., U. Omanakuttan, J. Devika and N. Jagajeevan (2019) 'Planning a "slum free" Trivandrum: Housing upgrade and the rescaling of urban governance in India', *Environment and Planning C: Politics and Space* **37**(2):256-276
Willis, K. S. (2019) 'Whose right to the smart city?', in P. Cardullo, C. Di Feliciantonio and R. Kitchin (eds) *The Right to the Smart City*, Emerald Publishing Limited, Bingley, pp. 27-41
Woetzel, J., N. Garemo, J. Mischke, P. Kamra and R. Palter (2017) *Bridging Infrastructure Gaps: Has the World Made Progress?,* McKinsey & Company, New York, https://www.mckinsey.com/business-functions/operations/our-insights/bridging-global-infrastructure-gaps, last accessed 3 May 2022
Wood, A. J., M. Graham, V. Lehdonvirta and I. Hjorth (2019) 'Good gig, bad gig: Autonomy and algorithmic control in the global gig economy', *Work, Employment and Society* **33**(1): 56-75
World Bank (2010) *World Development Report 2010: Development and Climate Change,* World Bank, Washington, DC, http://www.worldbank.org/wdr, last accessed 25 February 2022
World Bank (2015) *World Inclusive Cities Approach Paper*, Report No. AUS8539, World Bank, Washington, DC, https://documents1.worldbank.org/curated/en/402451468169453117/pdf/AUS8539-REVISED-WP-P148654-PUBLIC-Box393236B-Inclusive-Cities-Approach-Paper-w-Annexes-final.pdf, last accessed 5 May 2022
World Bank (2016) *World Development Report 2016: Digital Dividends*, World Bank, Washington, DC
World Bank (2018a) *Poverty and Shared Prosperity 2018: Piecing Together the Poverty Puzzle*, World Bank, Washington, DC
World Bank (2018b) *Ghana Secondary Cities Support Program Technical Assessment*, World Bank, Washington, DC, https://documents1.worldbank.org/curated/en/107671536083152882/pdf/Final-Technical-Assessment-Ghana-Secondary-Cities-Support-Program-P164451.pdf, last accessed 04 March 2022
World Bank (2018c) 'What a waste: An updated look into the future of solid waste management', https://www.worldbank.org/en/news/immersive-story/2018/09/20/what-a-waste-an-updated-look-into-the-future-of-solid-waste-management, last accessed 8 November 2021
World Bank (2020a) 'GDP (current US$)', World Bank: Data, https://data.worldbank.org/indicator/NY.GDP.MKTP.CD, last accessed 6 May 2022
World Bank (2020b) 'Global action urgently needed to halt historic threats to poverty reduction', https://www.worldbank.org/en/news/feature/2020/10/07/global-action-urgently-needed-to-halt-historic-threats-to-poverty-reduction, last accessed 5 May 2022
World Bank (2020c) 'COVID-19 turns spotlight on slums', https://www.worldbank.org/en/news/feature/2020/06/10/covid-19-turns-spotlight-on-slums, last accessed 5 May 2022
World Bank (2020d) *Urban Mobility and Covid-19 in Africa: Transport Global Practice, World Bank Group Africa Transport Policy Program*, https://www.ssatp.org/sites/ssatp/files/publication/COVID19%20and%20Public%20Transport%20in%20Africa%20-%20FINAL%20-%20Aug2020%20-%20ENGLISH.pdf, last accessed 5 May 2022
World Bank (2020e) *Poverty and Shared Prosperity 2020: Reversals of Fortune*, World Bank, Washington, DC
World Bank (2020f) *Mauritania. Country Economic Memorandum: Accelerating Growth Through Diversification and Productive Cities*, World Bank, Washington, DC
World Bank (2020g) *City Resilience Program: Annual Report July 2019 – June 2020,* http://documents1.worldbank.org/curated/en/343941611599652517/pdf/City-Resilience-Program-Annual-Report-July-2019-June-2020.pdf, last accessed 11 May 2022
World Bank (2020h) *City Resilience Program: Annual Report July 2020 – June 2021,* http://documents1.worldbank.org/curated/en/835361644295920445/pdf/City-Resilience-Program-Annual-Report-July-2020-June-2021.pdf, last accessed 11 May 2022
World Bank (2021a) 'Future of cities will shape post-COVID-19 world', https://www.worldbank.org/en/news/feature/2021/03/02/future-of-cities-will-shape-post-covid-19-world, last accessed 8 November 2021
World Bank (2021b) 'Narrowing the digital divide can foster inclusion and increase jobs', https://www.worldbank.org/en/news/feature/2021/09/24/narrowing-the-digital-divide-can-foster-inclusion-and-increase-jobs, last accessed 27 September 2021
World Bank (2021c) *World Development Report 2021: Data for Better Lives*, http://www.worldbank.org/wdr, last accessed 25 February 2022
World Bank (2022a) *Inequality in Southern Africa: An Assessment of the Southern African Customs Union*, World Bank Group, Washington, DC
World Bank (2022b) *Global Economic Prospects, January 2022*, World Bank, Washington, DC
World Data Lab (2022) 'World poverty map', https://worldpoverty.io/map, last accessed 6 May 2022
World Economic Forum (2017) *Harnessing the Fourth Industrial Revolution for Sustainable Emerging Cities*, World Economic Forum, Geneva
World Economic Forum (2020a) 'Coronavirus has exposed the digital divide like never before', https://www.weforum.org/agenda/2020/04/coronavirus-covid-19-pandemic-digital-divide-internet-data-broadband-mobbile/, last accessed 25 February 2022
World Economic Forum (2020b) *The Future of Jobs Report 2020,* World Economic Forum, Cologny
World Economic Forum and IDFC Forum (2021) *Indian Cities in the Post-Pandemic World*, World Economic Forum White Papers, https:// https://www3.weforum.org/docs/WEF_Indian_Cities_in_the_Post_Pandemic_World_2020.pdf, last accessed 11 May 2022
World Commission on Environment and Development (1987) *Our Common Future*, Oxford University Press, Oxford
World Resources Institute, International Trade Union Confederation, and New Climate Economy (2021) *The Green Jobs Advantage: How Climate-friendly Investments Are Better Job Creators*, Working Paper, https://www.wri.org/research/green-jobs-advantage-how-climate-friendly-investments-are-better-job-creators, last accessed 6 June 2022
Wright, M. (2021) 'How the digital divide threatens the success and legitimacy of the COP26 talks', https://www.iied.org/how-digital-divide-threatens-success-legitimacy-cop26-talks, last accessed 13 October 2021
Wu, F., and F. Zhang (2021) 'Rethinking China's urban governance: The role of the state in neighbourhoods, cities and regions', *Progress in Human Geography: an international review of geographical work in the social sciences and humanities* (in press)
Wu, Z., R. Chen, M.E. Meadows, D. Sengupta and D. Xu (2019) 'Changing urban green spaces in Shanghai: Trends, drivers and policy implications', *Land Use Policy* **87**: 104080
WWAP (United Nations World Water Assessment Programme)(2016) *The United Nations World Water Development Report 2016: Water and Jobs*, United Nations Educational, Scientific and Cultural Organization, Paris, http: //www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/2016-water-and-jobs/, last accessed 3 May 2022
WWF (World Wide Fund For Nature) (2020) 'One Planet City Challenge', https://wwf.panda.org/projects/one_planet_cities/one_planet_city_challenge_2021_2022, last accessed 20 May 2022
Yadav, V., S. Ghosh, K. Mueller, A. Karion, G. Roest, S. M. Gourdji, , I. Lopez-Coto, K. R. Gurney, N. Parazoo, K. R.Verhulst, J. Kim, S. Prinzivalli, C. Fain, T. Nehrkorn, M. Mountain, R. F. Keeling, R. F. Weiss, R. Duren, C. E. Miller and J. Whetstone (2021) 'The impact of COVID-19 on CO_2 emissions in the Los Angeles and Washington DC/Baltimore metropolitan areas' *Geophysical Research Letters* **48**(11): e2021GL092744
Yadavalli, A., C. K. McFarland and S. Wagner (2020) *What COVID-19 Means for City Finances*, https://covid19.nlc.org/wp-content/uploads/2020/06/What-Covid-19-Means-For-City-Finances_Report-Final.pdf, last accessed 27 February 2022
Yamagata, Y. and P. Yang (eds) (2020) *Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era*, First Edition, Elsevier, Netherlands, Oxford and Cambridge, USA
Ye, L. (2014) 'State-led metropolitan governance in China: Making integrated city regions', *Cities*, ***41***:200-208
Yigitcanlar, T. and F. Cugurullo (2020) 'The sustainability of Artificial Intelligence: An urbanistic viewpoint from the lens of smart and sustainable cities', *Sustainability* **12**(20): 8548
Yigitcanlar, T., J. M. Corchado, R. Mehmood, R. Yi Man Li, K. Mossberger and K. Desouza (2021) 'Responsible urban innovation with local government Artificial Intelligence (AI): A conceptual framework and research agenda', *Journal of Open Innovation: Technology, Market, and Complexity* **7**(71): 71
Yiran, G. A. B., A. D. Ablo, F. E. Asem and G. Owusu (2020) 'Urban sprawl in Sub-Saharan Africa: A review of the literature in selected countries', *Ghana Journal of Geography* **12**(1): 1-28
Yli-Pelkonen, V. and J. Kohl (2005) 'The role of local ecological knowledge in sustainable urban planning: Perspectives from Finland', *Sustainability: Science, Practice and Policy* **1**(1): 3-14

You, H., X. Wu, and X. Guo (2020) 'Distribution of COVID-19 morbidity rate in association with social and economic factors in Wuhan, China: Implications for urban development', *International Journal of Environmental Research and Public Health* **17**(10): 3417

You, X. (2021) 'Analysis: how power shortages might "accelerate" China's climate action', *Carbon Brief*, 13 October, https://www.carbonbrief.org/analysis-how-power-shortages-might-accelerate-chinas-climate-action, last accessed 19 March 2022

Young, G. W., R. Kitchin and J. Naji (2021) 'Building city dashboards for different types of users', *Journal of Urban Technology* **28**(1-2): 289-309

Zakaria, F. (2020) *Ten Lessons for a Post-Pandemic World*, W. W Norton & Company, New York

Zapata, M. A. and N. Kaza (2015) 'Radical uncertainty: Scenario planning for futures', *Environment and Planning B: Planning and Design* **42**(4): 754-770

Zelinsky, W. (1971) 'The hypothesis of the mobility transition', *Geographical Review* **61**(2): 219-249, https://doi.org/10.2307/213996, last accessed 6 April 2022

Zeng, D. Z. (2016) *Building a Competitive City through Innovation and Global Knowledge. The Case of Sino-Singapore Suzhou Industrial Par*, Policy Research Working Paper, No. 7570, World Bank, Washington, DC

Ženka, J, O. Slach and A. Pavlík (2019) 'Economic resilience of metropolitan, old industrial, and rural regions in two subsequent recessionary shocks', *European Planning Studies* **27** (11): 2288-2311

Zhang, F. and F. Wu (2019) 'Rethinking the city and innovation: A political economic view from China's biotech', *Cities* **85**: 150-155

Zhang, J., L. Yan and Y. Yuan (2019) 'Rural-urban migration and mental health of Chinese migrant children: Systematic review and meta-analysis', *Journal of Affective Disorders* **257**: 684-690

Zhang, M., P. Zhao and S. Qiao (2020) 'Smartness-induced transport inequality: Privacy concern, lacking knowledge of smartphone use and unequal access to transport information', *Transport Policy* **99**: 175-185

Zhang, Y. and Y. Li (2015) 'The application of the smart technique in the construction and management of urban park green spaces', *International Journal of Smart Home* **9**(9): 113-118

Zhen, S. (2021) 'Free public transportation: why we need it, and examples from Korean and European cities', *Sustainable Mobility ICLEI*, 30 April, https://sustainablemobility.iclei.org/free-public-transportation, last accessed 19 March 2022

Zhong, H., J. Xu and A. R. Piquero (2017) 'Internal migration, social exclusion, and victimization: An analysis of Chinese rural-to-urban migrants', *Journal of Research in Crime and Delinquency* **54**(4): 479-514

Zhou, L. and B. Parmanto (2019) 'Reaching people with disabilities in underserved areas through digital interventions: Systematic review', *Journal of Medical Internet Research* **21**(10): e12981

Zhuang, Z. C., S. Edge and J. Dean (2021) 'What is the future of public space? Hidden stories of immigrant suburbs during a global pandemic', *Town Planning Review* **92**(2): 229–237

Ziegler, S., M. Menon and P. Annichino (2019) 'IoT privacy and security in smart cities', in S. Ziegler (ed) *Internet of Things Security and Data Protection*, Springer, Netherlands, pp.149-171

Ziervogel, G. (2019) 'Building transformative capacity for adaptation planning and implementation that works for the urban poor: Insights from South Africa', *Ambio* ***48***(5): 494-506

Ziervogel, G., M. Pelling, A. Cartwright, E. Chu, T. Deshpande, L. Harris, K. Hyams, J. Kaunda, B. Klaus, K. Michael, L. Pasquini, R. Pharoah, L. Rodina, D. Scott and P. Zweig (2017) 'Inserting rights and justice into urban resilience: A focus on everyday risk', *Environment and Urbanization* **29**(1): 123-138

Ziller, C. and S. W. Goodman (2020) 'Local government efficiency and anti-immigrant violence', *The Journal of Politics*, ***82***(3):895-907

Ziter, C. D., E. J. Pedersen, C. J. Kucharik and M. G. Turner (2019) 'Scale-dependent interactions between tree canopy cover and impervious surfaces reduce daytime urban heat during summer', *Proceedings of the National Academy of Sciences* **116**(15): 7575-7580

World Cities Report 2022

Envisaging the Future of Cities

The emergence of the COVID-19 pandemic in 2020 created a temporary crisis of confidence in the future of cities. However, a broad consensus is that urbanization remains a powerful twenty-first century mega-trend; and that well-planned towns and cities remain central to the sustainable development trajectory. There is a sense of optimism that the crisis may provide us with the opportunity to build back differently, more inclusively, greener and safer.

World Cities Report 2022: *Envisaging the Future of Cities* seeks to provide greater clarity and insights into the future of cities based on existing trends, challenges and opportunities, as well as disruptive conditions, including the valuable lessons from the COVID-19 pandemic, and suggests ways that cities can be better prepared to address a wide range of shocks and transition to sustainable urban futures. The Report proposes a state of informed preparedness that provides us with the opportunity to anticipate change, correct the course of action and become more knowledgeable of the different scenarios or possibilities that the future of cities offers.

Building economic, social and environmental resilience, including appropriate governance and institutional structures, must be at the heart of the future of cities. Economic resilience with new fiscal sustainability frameworks, societal resilience with universal social protection schemes, climate resilience with greener investments and stronger multilevel collaboration to confront future shocks—these are the main elements of a resilient future that can withstand and respond to the various threats and shocks facing urban areas.

The Report identifies three possible scenarios of urban futures: high damage, pessimistic and optimistic. Avoiding the high damage scenario and manifesting an optimistic urban future requires collaborative, well-coordinated and effective multilateral interventions. The response to the current urban crisis can lead to a collective reprioritization of cities across the world towards shared prosperity and inclusion.

The Report shows that the path to sustainable urban futures will be determined by inclusive and transformative policies to eradicate poverty and inequality; produce urban economies that provide opportunities for all; generate greener investment for sustainable consumption and production patterns; pursue responsive urban and territorial planning; implement collaborative and integrated governance; prioritize public health; deploy inclusive innovation and technology; and build resilience across multiple dimensions. During the Decade of Action (2020–2030), cities and subnational governments must urgently adopt approaches that will foster the optimistic scenario of urban futures. The localization and effective implementation of the New Urban Agenda serves as a framework for integrating the interrelated components that constitute these pathways.

UN-HABITAT
FOR A BETTER URBAN FUTURE

UNITED NATIONS HUMAN SETTLEMENTS PROGRAMME
P.O. Box 30030, Nairobi 00100
E: unhabitat-info@un.org
www.unhabitat.org
@UNHABITAT

HS Number: HS/004/22E
ISBN Number(Series): 978-92-1-133395-4
ISBN Number: 978-92-1-132894-3

ISBN 978-92-1-132894-3
9 789211 328943