Report of the UN Economist Network for the UN 75th Anniversary

Shaping the Trends of Our Time

SEPTEMBER 2020

United Nations

IN SUPPORT OF UN75 2020 AND BEYOND SHAPING OUR FUTURE TOGETHER

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Foreword

In the last 75 years the global community has reached levels of prosperity unimaginable just two generations ago. In this time, global poverty has substantially declined, and people everywhere are living longer and healthier lives. Yet the achievements have been remarkably unbalanced. Gains in prosperity have almost always come at the cost of environmental degradation and damage, and they have also been unequally shared, with many people and countries that escaped extreme poverty at constant risk of slipping back.

The 2030 Agenda for Sustainable Development with its 17 Sustainable Development Goals (SDGs) offers a blueprint for prosperity, people and planet that addresses these deficiencies. But the Agenda is already off-track. The devastating impacts of the COVID-19 crisis have further diminished prospects for achieving the SDGs, with the greatest adverse impacts falling on countries and people least able to protect themselves, and already at greatest risk of being left behind.

The pandemic comes at a time when several megatrends are defining the course of progress towards sustainable development. This report focuses on five of the most important: climate change; demographic shifts, particularly population ageing; urbanization; the emergence of digital technologies; and inequalities.

Because these megatrends exert a pervasive influence on the SDGs, achieving the Goals depends critically on the success of policy interventions to shape them.

Decades in the making, the megatrends cannot be easily undone or changed in any significant way in the immediate term. But they are the result of human activity, and therefore they can be shaped over time by consistent policies. And because each megatrend also affects the other megatrends, reinforcing or counteracting them, policy interventions in one area can generate positive and mutually reinforcing impacts in another.

The COVID-19 crisis has not only dimmed prospects for achieving the 2030 Agenda, but also affects each of the megatrends. At the same time, the crisis offers a powerful opportunity to recover better and tackle difficult issues that will be instrumental in putting the megatrends on a positive course for the future.

This report draws four key conclusions for effective policymaking to steer the megatrends in the right directions. First, policies should build on the causal links among the megatrends. Second, interventions with regressive effects in another area should be avoided. Third, coordinated and well-sequenced interventions in different areas can exploit potential co-benefits and generate greater positive impacts. And

fourth, effective policymaking requires balancing trade-offs between gains and losses.

Dealing with climate change requires a global effort. No individual country can determine the course of this megatrend on its own. The other four megatrends can be decisively shaped by national policies, but global coordination and joint efforts can contribute to more significant and positive changes, underscoring the vital importance of multilateral consensus and collaboration.

As we celebrate the past 75 years of the United Nations and look forward, it is clear that the United Nations must play a central role in helping to guide the megatrends in line with the commitments made in the 2030 Agenda. The United Nations can support governments to frame responses that encourage domestic political consensus around sustained action, including through critical partnerships among different stakeholders. The United Nations is also the source of much of the data and analysis needed to inform effective policymaking.

Above all, the United Nations links Member States and people around the world to foster the spirit of multilateralism that galvanizes needed global support for individual countries, particularly those with fewer resources and greater vulnerabilities.

We live in a world of hope and possibility, and enormous achievement. We can build on what has been accomplished, but also shape new directions, realizing what has been promised to make a better future for all.

Liu Zhenmin
Under-Secretary-General
United Nations Department of
Economic and Social Affairs

Explanatory note

The term "country" as used in the text also refers, as appropriate, to territories or areas. The designations of country groups are intended solely for statistical or analytical convenience and do not necessarily express a judgment about the stage of development reached by a particular country or area in the development process.

The views expressed in this publication are those of the authors and do not necessarily reflect the opinions and policies of the United Nations. All queries should be addressed to DESA-UNEN@un.org.

THE FOLLOWING ABBREVIATIONS WERE USED:

ACCA	Association of Chartered Certified Accountants
AfDB	African Development Bank
BEPS	Base erosion and profit shifting
CBD	Convention on Biological Diversity
COMESA	Common Market for Eastern and Southern Africa
ECLAC	Economic Commission for Latin America and the Caribbean
ELD	Economics of Land Degradation
EPI	Economic Policy Institute
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
ESCWA	Economic and Social Commission for Western Asia
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross domestic product
GSDR	Global Sustainable Development Report
IADB	Inter-American Development Bank
IATF	Inter-agency Task Force
IBPES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
ICT	Information and communication technology
IDMC	Internal Displacement Monitoring Centre
IEA	International Energy Agency
IFA	International Federation of Accountants
IFPRI	International Food Policy Research Institute
ILO	International Labour Organization
IMF	International Monetary Fund
IOM	International Organization for Migration
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IRP	International Resource Panel
MDGs	Millennium Development Goals
OECD	Organisation for Economic Co-operation and Development
SDGs	Sustainable Development Goals
SNA	System of National Accounts
UN-Habitat	United Nations Human Settlement Programme
UNCCD	United Nations Convention to Combat Desertification
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UNU-WIDER	United Nations University World Institute for Development Economics Research
WHO	World Health Organization

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Introduction 1

The last 75 years have brought fundamental changes in the human condition. The global community has achieved a level of prosperity unimaginable a mere two generations ago. Global poverty has declined substantially, particularly since the dawn of the twenty-first century, and people everywhere are living longer and healthier lives. Democratic institutions have been strengthened around the world and become more efficient at delivering effective public services. The concept of universal human rights has evolved from an aspiration to the guiding principle of most societies and governments.

But human experience in this period has not been an unmitigated success. Our achievements have been remarkable, but they have also been remarkably unbalanced. The global community has failed to eradicate the scourge of conflict and war. Huge gains in prosperity have been unequally shared, and many of the people and countries that have escaped extreme poverty are at constant risk of slipping back, for want of robust and resilient socioeconomic structures to protect their advances.

For much of the decade of the 1990s and the early 2000s, steady economic progress masked many concerns. The global financial crisis in 2008 and the Great Recession that ensued tore the mask away, and generated a greater willingness to examine issues in a new light. The crisis also unleashed a renewed spirit of multilateral cooperation, spurred by the necessity of a coordinated and common response, and the relative success of the Millennium Development Goals (MDGs), which demonstrated what could be achieved through concerted efforts.

Continued economic and social insecurities and inequities have lessened trust in institutions, however, and led to waves of recent protests. Economic success has thus far almost always come at the cost of environmental degradation and damage, and evidence of accelerating environmental degradation and the climate crisis grows more compelling each day. In an era of fragmentation and frustration, societies are gradually turning away from the spirit of multilateral cooperation.

Over the past five years, with all of these issues reaching a crescendo, there has been agreement that we have been on the wrong path, and that we need to change the course of development to one oriented around interwoven economic, social and environmental dimensions, as first established by the Earth Summit in Rio de Janeiro in 1992.

The 2015 adoption of the 2030 Agenda for Sustainable Development and the Paris Agreement on climate change created a new development paradigm, a blueprint for prosperity, people and planet predicated on partnerships and multilateralism. The 2030 Agenda, with its 17 Sustainable Development Goals (SDGs), has caught the imagination of the global community and become the frame of reference for policy discussions and partnerships around the world.

Yet the Agenda is already off-track. Policy commitments have not translated into policy actions. Sustainable finance is increasing, but neither fast enough nor at the necessary scale. The change in behaviours and mindsets does not yet match our ambitions for sustainable development.

The megatrends that shape our world

The lack of success in staying on track for the SDGs reflects deficiencies in public policy, and the slow pace of change in investments, and patterns of consumption and production. Progress has also been subject to the influence of several megatrends shaping our world over time.

The present report examines some of the successes and failures of the past, with a view to identifying how our efforts must be reinforced and redirected to ensure that we achieve the full measure of the 2030 Agenda, and set the stage for an inclusive, sustainable and equitable future during the next 75 years. It elaborates five megatrends: climate change; demographic shifts, particularly ageing; urbanization; the emergence of digital technologies in the fourth industrial revolution; and inequalities.

Each of these megatrends has evolved continuously over decades, developing its own dynamics, and influencing economic, social and environmental dimensions of sustainable development. Each applies across boundaries and societal limits, and will persist over time, evolving as it builds upon itself and interacts with the other trends as well as other changes in societies.

These megatrends have become some of the most important factors driving fundamental societal change, influencing many of the issues and outcomes that public policy seeks to address. In fact, they have become so pervasive and well-established, in so many different countries and societies, that they seem beyond the control of policy, obeying their own internal momentum.

And yet, they all result from human activity. As such they can be influenced by human decisions and policies, their impacts attenuated or accentuated, their energy redirected. Some megatrends are manifestations of human progress – such as technological innovations, urbanization or demographic trends. Others are consequences of policy deficiencies so longstanding that the megatrend has assumed a life of its own, as with climate change and inequalities.

The nuanced distinction between these two rough groupings is essential in framing policies to steer the megatrends. The first three – demographic trends, urbanization and technological innovation –are “inevitable”. They will occur as long as humans act and interact with each other. They all generate explicit benefits for societies and economies, and should not be stopped or obstructed, but rather managed to maximize positive impacts and minimize any adverse ones.

The remaining two megatrends, however, are negative in their impacts. They result from outright failure in policy. Climate change and environmental degradation have no positive side, and have become the dangerous phenomena that they are today because of the inability or the unwillingness of policymakers to address the damaging externalities inherent in the prevalent economic paradigm. Similarly, from the societal point of view, there is nothing positive about

The lack of success in staying on track for the SDGs reflects deficiencies in public policy, and the slow pace of change in investments.

inequalities. They do create clear winners, but they also create many more losers, and the societal balance of this equation is always skewed to the downside. Inequalities are not inevitable. They too always result from policy choices.

Each of the three megatrends in the first group, while universal, can be decisively influenced by national policy. This is not the case with the two in the second group. Climate change is the quintessential "global public bad". It can only be solved by all countries acting in concert. Inequalities are something of a hybrid. Rectifying them within a country is indeed the obligation of national policymakers and requires building national consensus. But solving the fundamental inequalities among countries requires a cooperative global effort, without which certain countries and their peoples will be left behind.

There are, of course, other megatrends of great significance. Migration comes to mind, driven by climate change, demographic changes, conflict, urbanization and overall economic development, and in turn influencing all of these. This report focuses on only five megatrends for several reasons. First, each bears a direct link to the 2030 Agenda. Four of the five have their "own" SDG – climate change (SDG 13), urbanization (SDG 11), technological innovation (SDG 9) and inequalities (SDG 10). The fifth megatrend, demographic developments, features prominently in the targets of several SDGs. The megatrends therefore have a major influence on achieving the 2030 Agenda – or preventing its full attainment.

A second reason for selecting these five megatrends reflects the pronounced interlinkages among them. As an example, technological change in the first industrial revolution ushered in the age of fossil fuels, which has driven the global warming that causes climate change. But inversely, technological innovation will be at the heart of any solution. The expansion of the global population has accelerated urbanization and changes in land use that have significantly worsened environmental degradation and climate change. At the same time, balanced territorial development and urban planning are essential ingredients for the sustainability of our planetary ecosystem.

INTERLINKAGES AND INTERACTIONS

Each megatrend exerts a direct influence on sustainable development, broadly, but also more specifically on the other megatrends. As will be shown in the following chapters, climate change can reinforce rural-urban migration, for instance. Technological innovation and digitalization have clearly accentuated income inequalities. The megatrends do not merely influence each other, however. They also often act in combination, reinforcing their individual impacts. For example, existing inequalities in education and income can explain some of the technological divide between different groups in a society, and they can intensify adverse consequences as continued technological innovation deepens existing inequalities.

In other cases, one megatrend may slow or counteract the impact of another, be it positive or negative. Population ageing may raise concerns about constraints on innovation, labour force productivity and macroeconomic dynamism. Yet the decrease in fertility associated with the process can support greater gender equality, as women spend less of their lives in childbearing and childcare roles, and have better opportunities for education and labour market participation.

All of this means that policies that shape a given megatrend, and reduce or redirect its own impact, can also influence or reinforce other megatrends, generating co-benefits. This is an important consideration in the design and prioritization of policy interventions.

COVID-19 – A crisis and an opportunity

The COVID-19 pandemic is the greatest immediate challenge of our time. What began as a public health emergency has transformed into the deepest global recession since the Great Depression, as disruptions to production in some countries spread rapidly around the world through global supply chains. The containment measures to combat the spread of the virus have in effect called an unprecedented halt to demand, worsening the economic downturn, and directly stopping income and work in possibly billions of cases around the world.

The sheer size of the crisis threatens everything that has been achieved in sustainable development over the past five years, and much of the development progress made under the MDGs. Depending on how quickly the economies of the world can fully reopen and how soon the recovery process can actually begin, hundreds of millions of people around the world could be at risk of falling back into poverty, reversing the gains of the last two decades.

Moreover, the crisis has put all of the weaknesses that have hindered progress on the SDGs into even starker relief. Resource constraints; the gaps in health systems, public administrations and governance systems; and the lack of disaster preparedness have hampered the public response to the outbreak. In many cases, this has allowed the crisis to spread much more broadly.

The pandemic affects us all, but it does not affect us all equally. It has highlighted and deepened the fault lines of existing inequalities among and within countries. It unerringly has had the greatest adverse impacts on those countries and groups least able to protect themselves, and already at greatest risk of being left behind.

Another fault line has been exposed by the crisis. The global nature of the crisis and the fact that not all countries are equally well placed to undertake an effective response underscores the need for collective and coordinated support. Although the mechanisms for global collaboration are in place, however, a coordinated effort has not materialized, painfully confirming the weakening spirit of multilateralism since 2015.

The crisis has impacted the megatrends in different ways. The wholesale shift to online work because of the lockdowns has accelerated the digitalization of the economy, and the use of mobile apps in tracking, tracing and monitoring COVID-19 infections are but two examples of the many different ways that digital technologies have been deployed to adapt to the crisis and keep activities going, albeit in different forms. On the positive side, as economic activity has ground to a halt, so too has the generation of greenhouse gas emissions, air and water pollution. Other drivers of environmental degradation and climate change have also slowed dramatically.

Cities are the epicentres of the COVID-19 crisis. Local governments have borne the brunt of the pandemic and are playing a central role in the recovery. The urban nature of the

The COVID-19 crisis demonstrates that governments are capable of taking courageous steps and intervening on a massive scale.

pandemic has revealed deep inequalities among neighbourhoods in cities, challenges of coordination among different levels of government, and the limited fiscal autonomy of municipalities to manage the crisis. It has also demonstrated the vulnerability of essential workers and those living in inadequate housing, and the limitations of stay-at-home and social distancing policies for 1.2 billion people in urban slums and informal settlements.

As damaging as the crisis has been, it is also a huge opportunity. The rapid adoption of stimulus packages of unprecedented magnitude demonstrates that, when necessary and where possible, governments are capable of taking courageous steps and intervening on a massive scale.

The measures themselves have underscored a recognition that the resilience of societies and economies must be strengthened. Social protection measures were introduced where they were lacking and strengthened elsewhere, and deep-reaching fiscal measures are helping enterprises ward off bankruptcy and prevent the mass destruction of jobs. Monetary authorities have also intervened rapidly and on an unprecedented scale to protect the stability of financial markets and reduce volatility.

All of this could augur well for the recovery from the crisis, but it must not be a recovery back to what we had before. COVID-19 offers the opportunity to build back "better" while reinventing and reimagining many of our structures, activities and aspirations, and reorienting them decisively towards sustainable development. We have proven ourselves capable of imaginative and entirely unprecedented crisis responses. Governments have demonstrated great adaptability and flexibility, unleashing a dynamism that could lead to the rapid and all-encompassing transformation that the 2030 Agenda demands.

Unlike at the time of the last major global crisis, we know what needs to be done. The SDGs are the blueprint for the recovery and necessary transformation. The policy response to the crisis should trigger that transformation.

The objective of building back better through a sustainable recovery should also frame the interventions that will shape the megatrends and their impacts, so they reinforce and accelerate that transformation. Recovery offers the opportunity to address, head on, issues that under normal circumstances would have been very difficult to manage, and to do so in innovative ways.

Understanding the drivers, making the connections

CLIMATE CHANGE AND ENVIRONMENTAL DEGRADATION

Nature in all its forms is being significantly altered by human activity everywhere on the planet. Disruptions in ecosystems, losses of biodiversity and wildlife, fundamental changes in land use, and the declining quality of air, water and soil have consequences for economic development and livelihoods. Awareness of the damage being done to the natural environment has been heightened by the increasingly visible

phenomenon of climate change, caused by the human-induced warming of the atmosphere.

Climate change, while a global crisis, affects countries in different regions in different ways. The burden of environmental decline and climate change falls hardest on the small island developing States and the least developed countries and the most vulnerable groups, such as the elderly, women and children. Poverty, inequality and disadvantage have increased with recent warming, and will likely continue to worsen.

Drivers of climate change and environmental degradation

Global warming reached approximately 1°C above pre-industrial levels in 2017. Scientists project the damage to become irreversible if the temperature rise exceeds a threshold of 2.5°C.

Climate change has now become an independent driver of changes in natural systems, exacerbating other drivers. The long-standing trend of environmental damage and degradation has deepened and accelerated in recent decades under the twin pressures of growing populations and growing economies, together escalating demand for energy and material goods, and the resources to produce them.

The damage to the environment is pervasive and all encompassing. Biodiversity loss has become one of the major challenges of our time, propelled by land and sea use change. Ecosystems of all kinds – freshwater and forest ecosystems, inland waters, and polar, marine and coastal ecosystems – are declining in size and quality, due to climate change, overexploitation and overharvesting, pollution and invasive species. The function and resilience of terrestrial ecosystems is being undermined by the drainage of wetlands, the burning of old growth forests, and the conversion of grasslands into productive cropland and pastureland.

In most regions, water quality and soil contamination have worsened significantly, owing to organic and chemical pollution, such as from pathogens, pesticides, heavy metals and microplastics. Air pollution causes between 6 million and 7 million premature deaths annually. Marine litter associated with plastic pollution remains one of the most difficult waste and resource management challenges, while e-waste has become the fastest-growing waste stream globally, attributable to increased consumer demand, perceived obsolescence and inventions of new electronic devices.

Challenges and opportunities

The erosion of environmental capital is a global phenomenon. Unlike with other types of capital, the “depreciation” of natural capital (for example, through the damage done to ecosystems) is often irreversible if it goes beyond a tipping point. Moreover, there is only a limited possibility of substituting other forms of capital for natural capital. Its “depreciation” erodes the productive base and life-support systems necessary for economic progress and human well-bring.

The world now confronts other dangers from environmental damage. The rising risk of transmitting zoonotic viruses such as COVID-19 is largely due to human-induced environmental change such as forest cover conversion, and increased interactions between human settlements and nature. Addressing this upward trend will necessarily involve understanding

complex interactions between human society and ecological systems.

Impact on the SDGs

Climate change most obviously affects SDG 13 (climate action), while environmental degradation in its various forms, including biodiversity loss, impacts SDG 6 (clean water and sanitation), SDG 14 (life below water) and SDG 15 (life on land). Since the consequences fall hardest on the most vulnerable groups, there are impacts as well on SDG 10 (reduced inequalities).

Some of the more extreme consequences of climate change could lead to spikes in mortality among vulnerable population groups.

This megatrend intersects with other SDGs in many indirect ways. Since decarbonization will be an essential part of the solution to climate change, climate action contributes to the realization of SDG 7 (affordable and clean energy). The loss of natural capital through environmental damage undermines the basis of future prosperity and affects SDG 8 (decent work and economic growth).

Linkages to the other megatrends

The search for solutions to the climate crisis and other aspects of environmental degradation has accelerated and intensified technological innovation and the framing of new policies. These are reducing costs of producing, storing and using renewable energy technologies; changing agricultural practices, such as through irrigation technology and the shift away from chemical fertilizers and pesticides; prompting greater research into biodegradable products; and redesigning products to minimize waste and achieve more circular patterns of production and consumption.

Increasing livelihood and income insecurities caused by sea-level rise, severe weather events, droughts, climbing temperatures, insect infestations and water scarcity, as well as damage to ecosystems and the services they provide, can be expected to drive larger rural-urban migration flows and displace hundreds of millions of people from coastal cities.

Climate change and environmental degradation exacerbate the vulnerability of countries that rely on rain-fed agriculture even as they have relatively high population growth, population density and fertility rates. The same applies to less resilient population groups, including indigenous peoples and small landholders. Some of the more extreme consequences of climate change and environmental stress, such as heat waves, epidemics, insect infestation, and the increased scale, frequency and intensity of hydrological natural hazards could lead to spikes in mortality, especially among vulnerable population groups.

The impact of resource exploitation and environmental degradation caused by human activities concentrated in urban areas, such as the removal of natural storm buffers, pollution, overuse of water, the generation and disposal of waste, and the “urban heat island” effect, are all causes of climate change, the destruction of ecosystems and the loss of biodiversity. Inversely, sustainable urbanization enables more efficient use of

resources and more effective implementation of environmental conservation practices.

DEMOGRAPHIC TRENDS, WITH AN EMPHASIS ON POPULATION AGEING

The world's population has undergone major transformations over the last 75 years. The global population growth rate peaked in the 1960s, and has been slowing since then, possibly heading towards a standstill by the end of this century. In step with this trend, attention has shifted from population growth to population age structures, specifically "population ageing", rooted primarily in declining fertility and increasing life expectancy.

With changing age structures, household configurations and the living arrangements of older persons are also evolving. A significant and growing proportion of persons aged 60 or older live alone (8 per cent of men, but twice as many women, due mainly to their longer life expectancy).

Many older persons are in good health and remain productive members of the labour force. Even after they retire, they contribute to their communities and to the care of grandchildren, especially when both parents work outside the home. But this trend also raises questions about who will care for older people as their ability to carry out daily activities declines.

Drivers of population ageing

An early and universal driver of historical demographic transitions has been declining mortality. Fertility declines typically follow, resulting from improved pre- and postnatal health care and the expansion of sexual and reproductive health-care services, including family planning. Lower fertility has been by far the most important determinant of population ageing in the world.

The ultimate impact of the ongoing COVID-19 pandemic on mortality indicators such as the crude death rate or life expectancy is likely to be significant to large, especially in countries with older populations and/or weaker health systems. The age pattern of COVID-19-related mortality thus far is similar to that of all-cause mortality, but age distribution weighs heavily in the number of per capita COVID-19 deaths, as the virus has proved much deadlier for older persons than younger adults and children.

Challenges and opportunities

Between the early and advanced stages of the demographic transition, from younger to older populations, there is a "window of opportunity" for a "demographic dividend". This arises from the accelerated economic growth associated with the transformation in the age composition, particularly as a large share of the population is in the workforce. At its peak, this process can contribute between 1 and 1.7 percentage points of growth to annual gross domestic product (GDP) per capita, provided countries can meet the challenge of generating sufficient employment, and make large enough investments in human and physical capital to realize the dividend's full macroeconomic benefits.

A set of challenges associated with population ageing relates to the care economy – the demands for the care of children and older persons that often fall on the "middle" generation, typically in their prime productive years, and that are usually met predominantly by women. The need for adequate long-term care systems is rising with progressive

population ageing, but this also represents an opportunity to create jobs, many of which would likely be taken by women.

Impact on the SDGs

Demographic trends, including changing age structures, have significant impacts on many areas of sustainable development: on SDG 1, because they can help to reduce poverty and affect the fiscal balance of social protection systems; on SDG 2, because slower population growth reduces the aggregate demographic pressure in the fight against hunger, and can improve nutrition and food security; on SDG 3, due to the associated improvements in child and maternal health; and on SDG 4, because of the link between reduced fertility and increased investment in education per child.

Ageing is also related with SDG 5, as the factors that drive declines in fertility accelerate gender equality and the empowerment of women. It can contribute to SDG 8 through the demographic dividend, and to SDG 10, reducing inequalities as lower fertility differentials across socioeconomic groups facilitate broader access to services and economic opportunities for individuals over their lives.

Linkages to the other megatrends

Climate change influences demographic change through two main channels – by driving migration flows within and among countries, and by affecting morbidity and mortality risks. Population growth and age structure also determine carbon emissions, and can increase demand for food and raw materials, with an adverse impact on the overall environment.

Technological change has been fundamental to the dramatic lowering of mortality and fertility rates, lengthening life spans and slowing population growth. Further life-extending technological innovations may well determine the future course of population ageing and redefine what it means to be "old". Population ageing could reduce technological innovation and adoption, but it could equally be an economic incentive for innovations that save labour and respond to rising health-care demands.

Population ageing may contribute to worsening economic inequality within countries, as capital intensity is expected to increase in step with slower population growth. Rising fiscal pressure on transfer systems may require some combination of decreasing benefits or increasing taxes, on either labour income or assets. Inversely, extended access to health care, education, and other services and opportunities that are important drivers of the demographic transition tend to reduce inequalities of opportunity. Better realization of fertility intentions, whatever those may be, tend to improve gender equality.

Urbanization influences the pace of the demographic transition both through mortality and fertility. Urban areas tend to have lower mortality and fertility than rural areas, owing to higher incomes, greater accessibility to health-care services and efficiencies in health-care delivery. Higher educational levels, greater childbearing costs and easier access to family planning services in urban areas are also important factors.

URBANIZATION

In 2008, for the first time, more than half of the world's population lived in cities. This share will rise to 70 per cent by 2050. Urbanization rates will be most rapid in countries that are currently the most rural in sub-Saharan Africa, South Asia and several countries in South-East Asia.

The implications of urbanization are felt throughout a country, in rural areas, small towns, and intermediary as well as large cities. Understanding this megatrend therefore requires examining subnational regions, networks of cities, peri-urban areas, small towns in rural districts and rural-urban linkages.

Cities generate most of total greenhouse gas emissions, and account for over three quarters of the total consumption of resources, including energy, 50 per cent of global waste, and up to 85 per cent of global GDP. Cities also yield a disproportionate amount of revenue for governments. How governments manage urbanization thus has a direct impact on how successful they will be in transforming their economies and achieving sustainable development.

Drivers of urbanization and urban population growth

Natural population increases, rural-urban migration, reclassification of cities and international migration drive urbanization and urban population growth. Much of the increased growth of cities can be attributed to natural population growth, rather than rural-urban migration. With the administrative expansion of cities, many rural areas have become reclassified as urban areas, sometimes referred to as peri-urban areas. These are parts of cities with rural characteristics including agricultural activities, or urban sprawl that is poorly designed, inefficient and unsustainable.

Greater economic opportunities in urban areas are a principal factor behind rural-urban migration flows. National economic policy, investment, regulation and incentives significantly influence urbanization, balanced territorial development, rural livelihoods and the future of cities.

Challenges and opportunities

The challenge of providing adequate, well-serviced and affordable housing is acute in countries where urbanization is rapid and inadequately planned. Informal, unregulated settlements and slums are prevalent worldwide, and even constitute the dominant form of cities, small and large, in Africa, Asia and Latin America. Slum formation is closely related to the housing stock deficit.

Homelessness operates at the intersection of urban inequality, unemployment, gender disparities, racial discrimination, mental health, housing affordability and substance abuse as well as poorly managed urbanization. Homelessness is exacerbated by illegal forced evictions, and is often a problem for displaced persons fleeing natural disasters and conflict.

Cities and their inhabitants are directly affected by disasters (natural and human-made), and at times are epicentres of crises. They are also destinations for displaced populations. By 2015, almost 60 per cent of all refugees and more than 50 per cent of internally displaced people lived in urban areas. The 1.2 billion people in informal settlements around the world are particularly vulnerable to protracted conflicts and ever-increasing weather-related and health risks, in many instances due to poor urban planning and inadequate urban infrastructure.

Cities are important in sustaining rural development, helping to transform food systems to ensure food security, nutrition and sustainability. This requires strong connections between small producers and fresh-food value chains. Small towns and intermediate cities concentrate 60 per

cent of urban food demand. Their proximity to and close interaction with rural areas makes them key strategic sites for light manufacturing and food processing, and underscore the importance of balanced territorial development.

Impact on the SDGs

With over 50 per cent of the global population, 70 per cent of global energy use and up to 85 per cent of economic activity, cities and urban areas hold the key to sustainable development. Much more than any of the other megatrends examined in this report, urbanization affects all of the SDGs, directly or indirectly. Success in addressing any of the challenges posed by urbanization will generate direct advantages or indirect co-benefits across the entire sustainable development agenda. Among policy interventions, urban policy may offer the greatest impact across the three dimensions of society, the economy and the environment.

Linkages to other megatrends

The urbanization megatrend is intrinsically linked to other megatrends. Cities are massive consumers of water, land, food and energy. They produce large amounts of waste, including from infrastructure and building materials. Building green cities, with resilient infrastructure, housing and basic services, will be the foundation of successful climate action. Carefully managing the expansion of urban settlements will underpin effective conservation of the environment.

Cities reflect national inequalities in concentrated form, and it is there that poverty and exclusion are both most visible and particularly hard to eliminate. Cities also offer opportunities for inclusion through participatory planning and targeted investment, including in sustainable services and infrastructure. These can significantly reduce spatial disparities, and mitigate multiple forms of discrimination.

Much of the increased expansion of cities can be attributed primarily to natural population growth, a critical link between demographic dynamics and urbanization. By the same token, slowing global population growth is attributed in part to urbanization. Women's access to health care, family planning, diverse sources of information and other factors in cities tends to lower the average family size of urban households. Population age structure directly impacts urbanization as well. Cities in Africa and Asia are populated primarily by younger persons while many urban areas in North America, Europe and Japan are inhabited by older persons. How cities harness the "youth dividend" and manage population ageing will have significant implications for social cohesion and economic transformation.

Technological innovation plays an important role in sustainable urbanization. "Smart cities" use frontier technology to become more socially inclusive, prosperous and environmentally sustainable. "Smart grids" and renewable energy networks, modern waste disposal techniques, and reuse, recycling and repurposing practices facilitate the transition to a circular economy. The use of big data in congestion management, the organization of distribution systems, and the planning of public transportation are all examples of how technology and sustainable urbanization are intertwined. Technological innovation will be an important ingredient enabling countries to connect networks of cities and link urban areas to surrounding rural areas.

DIGITAL TECHNOLOGIES

Digital technologies – the representation of information in bits, and its storage and processing

– are increasingly ubiquitous, affecting every aspect of human activity. The widespread use of these and other technologies is transforming how we work and enjoy our leisure, and what we produce and consume, how much and where.

The combination of the near-universal applicability of digitization with transformative technological breakthroughs defines the digitalization megatrend. This process is unleashing social and economic structural shifts that are long term and irreversible, with far-reaching consequences – both positive and negative – for humanity.

Drivers of technological innovation and digitalization

Technological progress depends on several factors. These include an enabling regulatory environment with a competitive market structure providing incentives to innovate and invest in research and development. Complementary infrastructure comprises a dynamic financial system able to fund initially risky ventures, appropriate technical and research facilities, responsive legal and business services, and high-quality telecommunication and transportation infrastructure. A conducive intellectual property rights regime neither constrains the flow of new knowledge and technologies nor limits the returns to innovation. Lower barriers to accessing knowledge and technologies support further innovation.

The ease of access to technologies and the ability to adapt them at relatively low cost are other important structural drivers of innovation. Institutions tasked to accelerate the adoption of new technologies by the private sector can offer support by identifying requisite knowledge and resources. The rapid nature of technological change requires constant response and adaptation to avoid becoming hindered by legacy infrastructure and institutions.

Technological evolution interacts closely with globalization. The rise of artificial intelligence and ever more capable automation combined with global value chains have created growth and changed labour markets, deepening and accelerating globalization. At the same time, the speed and breadth of globalization is a major driver of technological innovation as firms respond to competitive pressures.

Challenges and opportunities

The ubiquity of digital technologies and their growing fusion with the physical world create inevitable risks. Frontier and emerging technologies can have unintended effects on economic inequality, the ability to effectively tax economic activity, natural resource use and social cohesion.

The ongoing wave of technological change is transforming labour markets on multiple fronts. While technological progress has contributed to job destruction over the past two centuries, it has also helped to create jobs, many in new sectors and industries. Manufacturing is being transformed by the rapid development of sensors, motors and software in what is termed industry 4.0. As the costs of equipment and computing continue to fall, and as demand for skills and jobs changes in response, countries find new opportunities for growth.

The rise of data as key productive inputs has created some tendencies for market power to concentrate, with significant distributional consequences. The digitalization of the economy also creates challenges in terms of national and international taxation. The rapid expansion in the use of digital devices and their shorter product

life cycles are driving up demand for energy and natural resources used in their manufacture, while creating a significant problem of e-waste.

Advances in digital technologies also create a wide array of ethical issues related to fairness, privacy and changes in social norms and values.

Digital dividends coexist with digital divides and inequalities, both among and within countries. While policies should help lay the foundation for an inclusive digital economy and society, as technological change has accelerated, mechanisms for cooperation and governance have often failed to keep pace. Divergent approaches and ad hoc responses threaten to fragment the interconnectedness that defines the digital age, leading to competing standards and approaches, lessening trust and discouraging cooperation. This complicates efforts to ensure that the benefits of the digital revolution outweigh its downsides.

Impact on the SDGs

Technological advances will be central to the achievement of many of the SDGs, making a positive contribution to the first seven Goals, covering poverty, health, education and other fundamentals of human development, as well as SDGs 13, 14 and 15, on climate action and the use of land and marine resources.

Innovations are particularly important in driving greater resource efficiency and decarbonization, and improving agricultural productivity, the quality of water and sanitation, health, and, increasingly, educational outcomes. Digital technologies, in particular, hold great potential for environmental benefits in many sectors, even as they pose challenges in terms of waste, natural resource use and energy consumption.

Digital technology is rapidly changing the nature and functioning of labour markets, economic productivity, and the sustainability and inclusiveness of growth, and will determine progress on SDG 8. Innovation is at the heart of SDG 9, on infrastructure and industrialization. Technology can be a major determinant of reducing inequalities under SDG 10, and achieving sustainable urbanization under SDG 11. It is fundamental to the transition to sustainable patterns of consumption and production, the aim of SDG 12.

Linkages to the other megatrends

The digital technology megatrend interacts with existing global patterns of inequality. Without compensating measures, innovators can take undue advantage of the digital divide compared to other groups. Countries with significant innovative activities will always preserve a lead over countries that mainly adopt new technologies ("follower countries"), much less those that continue to struggle to provide electricity, connectivity, water, sanitation and basic health technologies. Within countries, the digital divide determines which population groups will benefit from technological advances.

Digital technologies can help tackle challenges posed by major demographic trends. Population growth, urbanization and ageing propel the development of technologies to enhance physical and cognitive capacities, and allow older people to work longer. At the same time, more and better automation of agriculture, manufacturing and services can mean that a shrinking workforce will still produce enough to support a larger ageing population.

Digital technologies intersect with climate change particularly through the need to develop new forms of renewable energy generation and storage, and more efficiently manage energy

demand and use (such as through "smart grids"). More and better data coupled with recent innovations are opening new possibilities to reduce carbon emissions in key industries.

INEQUALITIES

The consequences of our unequal world play out in daily headlines. Despite the global rise in income and the rapid fall in extreme poverty, sharp disparities remain. Protests taking place in all regions reflect growing popular discontent.

Inequalities are high and rising across the globe, although trends are heterogeneous. Economic inequality as measured through the Gini index and other summary metrics has increased in some countries but declined in others since 1990. An overall global decline is due to a reduction of inequality among countries. Many developing countries, particularly in Asia, have grown faster than developed ones.

Income inequality within countries accounts for a growing share of global inequality, but there are substantial differences in trends. From 1990 to 2016, the Gini index rose in many high-income and several middle-income countries, including China and India. Latin America remains the region with the highest levels of income inequality, together with Africa, but the Gini has declined in most Latin American countries. Overall, it increased in 45 countries (accounting for 58 per cent of the world's population) and declined in 68 (26 per cent).

High and growing inequality hampers economic growth and slows poverty reduction. It has weakened workers' representation and social dialogue in the workplace. This, in turn, has negatively affected wages and working conditions.

When inequality is perceived as underlying a system that is unfair, people respond by losing confidence in institutions, with consequences for political stability. Perceptions of unfairness are heightened when social mobility is low. High levels of group-based inequality, together with high levels of income inequality among individuals, have also been associated with unrest and the probability of civil war.

Drivers of inequality

Income is increasingly concentrated among top earners in a majority of countries, even those where summary measures of overall inequality have declined. The income share of the richest 1 per cent of the global population has risen. The share of the bottom 50 per cent has also increased, although less rapidly. Those in the middle of the global income distribution have seen income fall.

Relatedly, the labour income share has declined since the 1980s in high- and middle-income countries. In addition to general declines in real worker compensation, the wage gap between top and bottom earners has shot up in many of these countries. Wealth is distributed even more unequally. The richest 1 per cent of adults currently owns as much as 33 per cent of global net wealth.

Inequalities in basic capabilities, including primary education and child health, have shrunk in a majority of countries, both among individuals and groups, yet inequalities in more advanced capabilities are still widening.

Group-based inequalities persist. Access to opportunity continues to depend on a person's gender, age, race, ethnicity, origin and levels of disability, among other attributes. The legacy of past inequalities has a direct effect

on the opportunities and outcomes of these groups, even where discriminatory behaviours have been eradicated. This is because groups who suffered from discrimination in the past start off with fewer assets, and less social capital and political power than those with historically privileged positions.

Place-based or spatial inequality reinforces inequalities linked to income, capacity, group and historical legacy. Each neighbourhood, settlement or even postal code has associations with the income, race or ethnicity of those who reside there. Where people are stigmatized because they come from a certain place, they can lose opportunities for employment, credit, essential services or political participation.

Impact on the SDGs

By its very nature, inequality cannot be reconciled with the fundamental principle of the 2030 Agenda, to leave no one behind. Accordingly, the Agenda, and specifically SDG 10 and its targets, call for reducing income- and group-based inequalities within and among countries, including through actions to ensure equal opportunity, and achieve equitable access to essential health, education and other services.

Existing inequalities in opportunities and basic capabilities render impossible the achievement of SDGs 1, 2, 3 and 4 related to poverty, food and nutrition security, health and education. Economic inequalities are barriers to SDGs 6, 7, 8 and 9, on water and sanitation, energy, work and industry. The inequitable treatment of women leaves SDG 5, on gender equality, out of reach.

As vulnerable and disadvantaged groups are more adversely affected by climate change, biodiversity loss and damage to ecosystems, existing inequalities are exacerbated by slow progress on SDGs 13, 14 and 15, pertaining to climate action, life below water and life on land. They also hinder advances on SDG 16, on peace, justice and strong institutions.

Linkages to other megatrends

Although many factors that drive growing inequalities are specific to countries or regions, there are also powerful global economic, social and environmental forces at play. Chief among them is the process of global integration. Technological innovation, climate change and urbanization also affect patterns of inequality. These global challenges require coordinated solutions and highlight the need for international cooperation

Global integration has created opportunities for countries, including low-income countries, to grow and develop, and thus has contributed to the decline in inequality among countries. But it also furthers its increase within countries. Global competition has encouraged producers to cut costs, including labour costs, while boosting returns to capital. It has eroded the collective representation and bargaining power of low-income workers. Globalization has also galvanized the expansion of the financial sector, which has been associated with growing income and wealth inequality.

Technological change has created winners and losers, operating at a pace that brings many challenges, despite immense promise. It is pushing wage inequality upward. And the potential to reduce disparities in health and education, among other areas, is thwarted by persistent digital divides sending benefits mainly to those at the top.

Climate change has slowed the reduction of inequality among countries and presents a

major obstacle to eradicating poverty. Within countries, people living in poverty and other disadvantaged groups are disproportionately exposed to climate risks. As importantly, climate change is affecting intergenerational inequality by reducing the livelihood opportunities of young and future generations. Climate action and the transition to green economies offer chances to diminish poverty and inequality but, as with any process of structural transformation, will result in job losses in some sectors.

Despite its many opportunities, urbanization has worsened inequality and deepened divides. An increasingly urban world will define the future course of inequality. Urban inequalities, notably spatial ones, must be addressed now to leverage the rapid and powerful pace of urbanization to act as a force for inclusion, particularly in the developing world.

Where do we go from here? Policies to shape the megatrends

Decades in the making, megatrends cannot easily be undone. Their impact on our lives and the structures of our societies and economies is pervasive and deep-seated. It will be impossible to change the megatrends in any significant way in the immediate term, through a measure or even set of measures. The megatrends cannot be simply stopped or reversed by administrative decision. But they can be shaped by consistent policy. It will, however, take time for changes to manifest.

The effects of any megatrend can be both positive and negative. Urbanization brings together all the factors necessary for technological innovation and productivity gains, for example, but urban centres generate most of the pollution and waste damaging the natural environment. Climate change is disrupting weather patterns and agricultural productivity, complicating the assurance of food security, but the search for a solution to it is also driving technological innovation that makes cities more efficient and sustainable. Addressing the negative outcomes of a megatrend may slow some of its positive ones, in the same or other dimensions.

Interlinkages among the megatrends mean that policies meant to steer one can influence others. Impact may go in any direction, but recognizing the connections offers the possibility to realize co-benefits, where positive impacts in one area result from an intervention to generate positive change in another. Not only are such policy interventions more effective, but they can also create mutually reinforcing changes that achieve significantly greater overall impacts.

The implications for policymaking are important. First, policymakers in each area must be aware of the causal links among the megatrends and how they interact, and be able to assess the indirect impacts of an intervention in one area on outcomes in another. Second, interventions in any area that may or will have a regressive effect in another area should be avoided. Third, mutually reinforcing impacts can be accentuated by coordinated policymaking in different areas, with interventions in one area designed and timed to coincide with interventions in another. And fourth, where impacts in two or more areas may run in opposing directions, effective policymaking will require balancing trade-offs between gains and losses, implying regular and effective horizontal and vertical coordination across various loci of decision-making.

These considerations will play an important role in prioritizing policy interventions and choosing among alternative approaches. Sequencing is also important. The digitalization of economies

is inevitable and imperative, for instance, but will also deepen inequalities unless accompanied, and in some cases preceded by, policies to create digital infrastructure, ensure universal access at an affordable cost, and provide lifelong education and training to all citizens to take full advantage of new jobs. As another example, expanded opportunities for employment are also essential in ensuring that a youth bulge is transformed into a demographic dividend, and that ageing societies can maintain their standards of living and achieve continued productivity gains through an active labour force.

Given the entrenched nature of the megatrends, policies to shape them and their impacts should focus on affecting their drivers. In some cases, this can be achieved in part by addressing the impacts of another megatrend, which may cut across the social, economic and environmental dimensions of sustainable development. Effective building codes that reduce energy use in urban centres are essential to sustainable urban planning that cuts overall demand for electricity as well as greenhouse gas emissions, for example. In other cases, effective interventions are within the same dimension of sustainable development. For instance, carefully managing changes in land use and reducing deforestation help to slow changes in hydrological cycles that can directly affect the weather, while preserving the carbon capture capacity of the forests and reducing global warming.

CLIMATE CHANGE AND ENVIRONMENTAL DEGRADATION

The drivers of climate change and environmental degradation are deeply rooted in the structures of our societies and economies. Transformative change will be critical in securing the resilience and functionality of ecosystems and natural capital, and halting climate change. Broadly speaking, transformation on the demand side involves conscious lifestyle changes affecting consumption preferences and behaviour, and on the supply side, cleaner production processes, greater resource efficiency and corporate responsibility through strong public-private partnerships.

In particular, there will need to be a major transition to sustainable food production systems (the main driver of human-induced land use change) and a deeper understanding of how biodiversity contributes to maintaining land productivity and livelihoods. Huge opportunities could open from harnessing the co-benefits of coastal ecosystem rehabilitation, such as restoring mangroves for flood mitigation.

Long-term strategic plans, such as the Post-2020 Global Biodiversity Framework, will need to include measurable, simple indicators for monitoring and halting biodiversity loss. Above all, the biodiversity agenda must become as mainstream as the climate action agenda, and fully engage all stakeholders.

To tap the power of integrated policy for cross-cutting issues, multifaceted approaches such as nature-based solutions, land degradation neutrality and the circular economy will be essential.

A critical part of the climate action agenda in all countries must be to accelerate the transition from fossil fuel to clean and renewable energy sources. Governments will need to make full use of market- and price-based incentive mechanisms, particularly carbon pricing and fossil fuel subsidy elimination. In addition, regulatory measures, such as mandating minimum fuel efficiency standards for vehicle fleets, minimum air

quality standards, differential taxation of vehicles according to their fuel economy, and the phasing out of all fiscal advantages for polluting industries, including fossil fuels, must be part of such a comprehensive approach.

Mobilizing sufficient finance for climate mitigation and adaptation is central to the realization of national climate action plans, but has fallen short of requirements. Multilateral and, increasingly, national development banks play an important role, but additional finance must be mobilized, including from the private financial sector. Innovative instruments, such as debt for climate swaps, hold promise.

The importance of protecting peatlands and other wetland ecosystems is paramount, given their efficiency in storing carbon, and providing vital biodiversity and ecosystem services globally. Steps to prevent the drainage of wetlands, the burning of old-growth forests or the conversion of grasslands into productive cropland and pastureland are essential to avert huge pressures on ecosystem functions and resilience. This highlights the opportunity for wide-scale land restoration, following the land degradation neutrality principle, that could increase agricultural productivity while slowing land conversion and deforestation.

DEMOGRAPHIC TRENDS AND POPULATION AGEING

By virtue of their long-term and slow-moving nature, demographic trends are not susceptible to rapid policy-induced change. The most successful policy interventions will be based on careful long-term planning.

Expanded access to sexual and reproductive health-care services underpins individual choice and the realization of intentions for childbearing. It helps reduce unintended and high-risk pregnancies, and maternal and infant mortality. It supports expanded schooling and economic opportunities for girls and women. Investing in education and health for all improves productivity and maintains economic growth, even as the working-age population shrinks. Such investment is necessary to exploit potential demographic dividends.

Lifelong learning will be increasingly important to keep up with technological change and ensure the flexibility of skills across the lifecycle. Specific training for older persons in the use of new technologies will endow them with greater opportunities to stay active, including in the labour market. Preventive health care helps to maintain the functional capacity and well-being of individuals in all stages of life, and is increasingly important as populations age.

Accelerating gender equality in employment by removing barriers to female participation and adopting family-friendly policies improves labour force participation, and sustains higher levels of economic activity and well-being. It is an effective way to address shrinking working-age populations and generate a “gender” dividend.

Monitoring and planning using age-disaggregated data are the basis of effective policymaking for more egalitarian ageing societies. Medium and long-run economic and fiscal forecasts that integrate demographic trends allow countries to assess and address the costs, sustainability, and, critically important in an era of rising inequality, the equity of policies and programmes.

Universal social protection with adequate benefits and the promotion of retirement savings are essential to reducing poverty and inequality,

and improving social resilience and inclusion. Such schemes must reach people working in the informal sector and unpaid care, many of whom are women, certain disadvantaged groups, and the aged and infirm. Adopting social security reforms that take account of the widening gap in longevity by socioeconomic status could contribute to narrowing inequality, taking due account of the welfare implications. An appropriate mix of public transfers, private transfers, work and savings is needed to spread the fiscal pressures associated with population ageing over time and across institutions.

Eliminating age-related discrimination, including age barriers in employment, would make an important contribution to reducing inequality, while increasing productivity and fostering inclusive economic growth.

SUSTAINABLE URBANIZATION

Carefully formulated national urban policies offer an instrument to orchestrate the opportunities of urbanization, manage its impacts on rural and peri-urban areas, and ensure balanced territorial development that leaves no one – and no place – behind. Governments should incorporate urbanization into national development and economic planning by targeting economic sectors that leverage urban potential and prioritizing urban investments that increase the productivity of cities. Economic planning explicitly guided by spatial considerations will help to build a system of diverse, specialized cities with complementary economic functions, bolstered by infrastructure investments that foster city networks and connect cities to rural areas.

Governments also need to strengthen local economic development and urban finance by devolving financial authority to municipal governments, enabling them to administer public services. Municipal governments should create incentives for private industry to support entrepreneurship in the informal economy, aggregate disparate micro-businesses and open employment opportunities for youth.

Urban industrialization policies to enhance productivity can create productive jobs and attract populations seeking employment opportunities. Industrial policies require appropriate environmental, social and governance standards. They should incorporate frontier technologies, intentionally link local firms to international production platforms, and encourage investment in infrastructure and renewable energy.

By introducing policies that change consumer behaviour, city authorities can radically reduce waste and support consumption patterns that facilitate circularity. Interventions could include programmes to valorize organic materials, including from wastewater and food waste, to generate revenue from the production of energy and compost, and incentivize the collection, recycling, reuse and repurposing of used consumer items.

To confront inequality and discrimination, local governments need to incorporate into urban planning processes the contributions of low-income households, youth, people living with disabilities, socially marginalized populations, older persons, the homeless, and, especially, women and adolescent girls. Urban planning should develop compact, mixed-use designs that generate urban land value, create job opportunities for the urban poor, reduce congestion and improve social inclusion. It should be integrated vertically to align municipal planning with regional investments in infrastructure and

transportation, and build policy coherence and investments across key economic sectors.

DIGITAL TECHNOLOGIES

Digital dividends coexist with digital divides. It is important, therefore, to establish policies to lay the foundations of an inclusive digital economy and society. As technological change has accelerated, the mechanisms for cooperation and governance around it have failed to keep pace.

To secure a digital future for the many, domestic and international policies should go beyond simply enlisting more developing country users and consumers into the digital economy. They should enable the building of domestic capabilities to create and capture value. Only then can digitalization fully support the 2030 Agenda.

Harnessing digital dividends will require up-to-date policies and regulatory frameworks in many areas, including innovation, financing, connectivity, labour markets, competition, and governance of the development and use of technologies. This calls for immediate action not only from countries themselves but also from the international community to support developing countries, especially the least developed countries, in adopting frontier technological breakthroughs.

Creating effective innovation systems requires developing capabilities and connections among key actors, strengthening regulatory and policy frameworks, building institutions and governance systems, supporting entrepreneurial ecosystems, and facilitating access to finance and human capital.

Financing policies should cover various aspects of innovation, including research, design and product development, as well as the adoption of new technologies, technology extension services and training. A mix of instruments, including innovative financing mechanisms, will likely be required. And public investment must play a complementary role, crowding in rather than crowding out private investment.

Indirect, long-term and non-traditional policy approaches to boosting entrepreneurship in the digital and digitally enabled sectors may be needed. Governments may seek to support the creation of regional innovation platforms and ecosystems, and identify innovation paths with long-term potential. It will be important to work towards providing a shared, open and enabling digital infrastructure.

Digital connectivity policy to extend digital infrastructure calls for measures to foster coordination among many stakeholders: governments, international organizations, local governments, communications service providers, makers of hardware and software, providers of digital services and content, civil society, and the various groups that oversee protocols and standards for digital networks.

Policies to mitigate the negative consequences of digitalization should include nimble and adaptive information and communication technology (ICT) regulations capable of safeguarding and protecting consumers and infrastructure, without hampering innovation or investment in new digital technologies. Digitalization and data policies to secure and maximize value from the digital economy may involve aspects such as national data strategies, protections of the rights of individuals, open-data guidelines, standards for the interoperability of data functions and promotion of skills relevant for the data economy. Governments should deal with existing and emerging barriers to the growth of their domestic data markets;

help firms develop strategies to extract and exploit their data; address the growing market concentration and dominance in the data economy; enhance consumer protection; and manage the cross-border flow of data.

INEQUALITIES

No single set of inequality-reducing policies applies to all countries or in all contexts. At the national level, any comprehensive strategy to address inequality should promote equal opportunity, increase redistribution and tackle discrimination, aiming to reduce inequality in all dimensions. The first of these building blocks includes policies aimed at expanding capabilities and therefore promoting equal access to opportunity. The second encompasses policies that affect the redistribution of incomes, wages and profits. While policies in the first group should alter the distribution of market income, those in the second should affect the distribution of disposable incomes. The third building block consists of policies meant to address prejudice and discrimination, and promote the participation of disadvantaged groups in economic, social and political life.

As foundations of an integrated approach, these three sets of policies are interdependent. Promoting opportunities, for instance, including through strong public education and health systems, requires public resources, which are mainly raised through taxes.

While governments and other national stakeholders retain central roles in tackling high inequalities, they are a global problem. Decisions by one country have ramifications for others through trade, finance and investment. In an interconnected world, national policymaking is increasingly constrained by decisions made beyond borders. At this critical time, multilateralism is under profound pressure, yet cooperation among countries remains essential, not least because the consequences of rising inequality do not respect national boundaries.

Key takeaways and potential for the United Nations

One of the megatrends, climate change, is an issue that can only be resolved through action by all countries. The others can all be addressed by national policies. All five, however, have evolved from policy deficiencies or outright failures. Moving forward, the United Nations can help to frame responses to the megatrends in terms that encourage domestic political consensus to take and sustain action. In doing so, the United Nations can assist in mobilizing needed global support for the efforts of individual countries, particularly those with fewer resources.

In the area of climate change, the United Nations Framework Convention on Climate Change will continue to guide coordinated global action for mitigation and adaptation. The United Nations plays a central role in promoting the mobilization of financing, and provides critical technical support to countries as they prepare and update nationally determined contributions and implementation plans in accordance with the Paris Agreement. The Convention on Biological Diversity; the Convention to Combat Desertification; the Basel, Rotterdam and Stockholm Conventions on chemicals; and a host of other international agreements also guide the actions and cooperation of United Nations Member States. These provide a powerful intergovernmental platform to address biodiversity loss, desertification and land use change; preserve ecosystems and the ecosystem services on which so many

livelihoods depend; and combat pollution and environmental degradation in all their forms.

The United Nations is the definitive source of data on demographic developments. This capacity can be further leveraged to deepen understanding of driving forces, advantages and disadvantages, and policies that can shape demographic trajectories over time. The United Nations can enable open discussion of policies to ensure that population trends generate potential demographic dividends, and help countries to anticipate and implement changing policy requirements. This can be of particular value in cases where the required changes run counter to deep-seated traditions and entrenched social norms.

Towards sustainable urbanization, United Nations databases and platforms such as the Global Urban Observatory and City Prosperity Index of the United Nations Human Settlements Programme (UN-Habitat) provide data essential for understanding and effectively directing the process. The United Nations also helps countries and cities mobilize financing for sustainable urban development and green cities. Revitalized United Nations country teams are working with governments to establish financing strategies that align public and private, international and domestic investments in key SDG targets. One such mechanism is the Cities Investment Facility, which is linked to private investors and the financing instruments of The World Bank and regional development banks.

Sustainable urban development involves many stakeholders and strategic partnerships. The World Urban Forum, created as a multistakeholder platform to promote the New Urban Agenda, convenes key constituencies every two years. At the intergovernmental United Nations Habitat Assembly inaugurated in 2019, all constituencies consult with Member States on formulating global urban policy.

As technology advances, its use must align with universally held ethical and human rights standards. The United Nations is uniquely positioned to facilitate dialogue among stakeholders to develop a global compact on agreed principles for managing frontier technologies. It can bring Member States and all relevant stakeholders together to forge consensus on legal and ethical standards, including to guide research and development. The 75th anniversary of the United Nations in 2020 presents an opportunity for a new "global commitment to digital cooperation" enshrining goals, principles and priority actions.

There is ample evidence of what has and has not worked to reduce inequality. Inaction is typically not due to a lack of technical advice or even, in most cases, adequate capacity. More often, mobilizing support for policy responses to inequality runs into a wall of vested interests. The United Nations can help governments overcome the political constraints, collect disaggregated data to assess the extent and nature of inequalities, and measure the success of interventions to reduce them. As the most important multilateral forum on addressing inequalities, including through its Commission on the Status of Women, the United Nations can strengthen international consensus around ending the most pervasive and damaging of all inequalities, the inequitable treatment of women and girls.

UN Photo/John Isaac

Climate change, natural capital and pollution 2

The SDGs clearly place the relationship between people and nature at the centre of sustainable development. More than half of the 169 targets for the 17 Goals relate directly or indirectly to nature. This connection is key to understanding which policies can usher in a more prosperous, just and healthy world. Wherever it is forgotten or becomes dysfunctional, the fundamentals of human existence are shaken. Disruptions in ecosystems, biodiversity and wildlife have consequences for economic development and daily life. These manifest in myriad ways, including, most recently, through the COVID-19 pandemic.

This chapter looks at climate change, examining trends in emissions and global warming, as well as the transition to renewable energy. It explores environmental degradation through the lens of natural capital, and presents broad directions in renewable and non-renewable natural capital. It addresses the complex theme of biodiversity and ecosystem services, touching on species diversity, and issues related to freshwater resources, marine and coastal areas, forests, and agriculture and grasslands. In a note of particular relevance to COVID-19, it delves into ecological disruption and zoonosis.

The chapter also examines the drivers of climate and environmental change, and considers the social impacts from a range of perspectives, including cross-cutting ones such as gender and inequality. It discusses recent trends in waste and pollution. The final section presents several policies aimed at transforming how climate change influences key aspects of sustainable development.

Trends in climate change

RISING EMISSIONS

Global greenhouse gas emissions have grown every year since the global financial crisis in 2009 at a rate of 1.5 per cent annually, stabilizing only briefly between 2014 and 2016 (UNEP, 2019a). The rise is due to robust growth in energy use. By contrast, carbon dioxide emissions from land use have remained relatively flat at about 7 per cent of total greenhouse gas emissions over the last decade (IPCC, 2018).[1] There is no sign of reaching peak emissions in the next few years. Every year of delay in reaching that peak implies deeper and faster cuts in emissions in subsequent years.

To keep the global temperature rise in this century well below the target in the Paris Agreement on climate change, which is 2°C above pre-industrial levels, much less to limit it even further to 1.5°C, the carbon budget that remains after deducting past emissions is between 150 and, at most, 1,050 gigatons of carbon dioxide. At current annual emissions rates, the lower limit of this range will be crossed in four years, and the midpoint (600 gigatons) in 15 years (box 2.1).

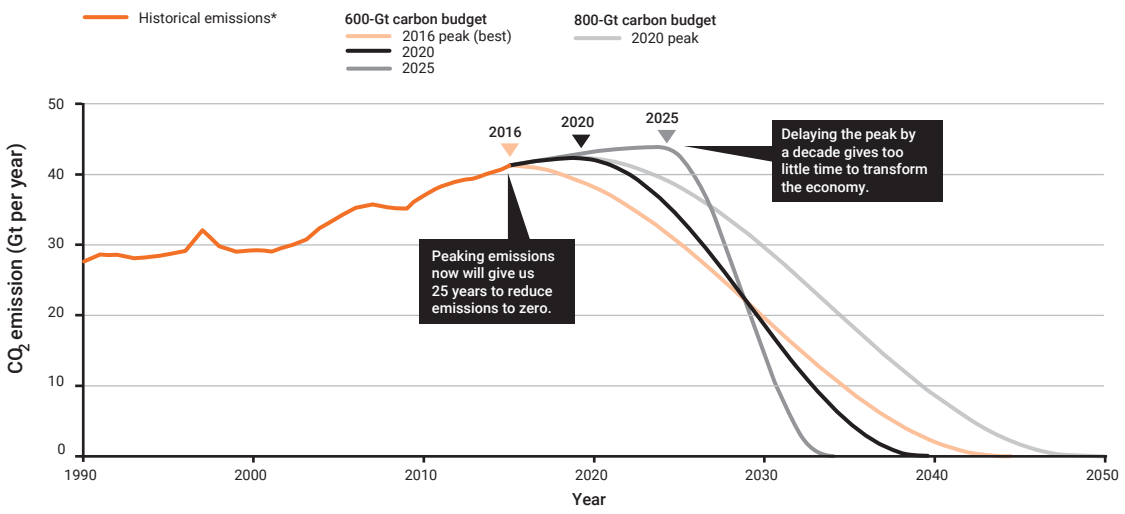
At the start of this new decade, emissions must decline by 7.6 per cent every year from 2020 to 2030. Otherwise, a historic opportunity to limit warming to 1.5°C will be lost. Uncertainties remain, particularly around the future of technologies such as those for carbon capture and storage. An increasing number of countries have committed to a net zero emissions target for 2050, but for the most part, this ambition has not yet

1 Methane is particularly problematic as a heat-trapping greenhouse gas; its impact is 34 times greater than carbon dioxide over a 100-year period (IPCC, 2013). Its contribution to global warming grew at 1.3 per cent per year in the last decade and 1.7 per cent in 2018.

BOX 2.1 THE CARBON CRUNCH

A mean cumulative emissions budget of around 600 gigatons (Gt) of carbon dioxide (CO_2) can still be emitted before the planet warms dangerously, by more than 2°C. Increasing the carbon budget to 800 gigatons buys another 10 years, but with the trade-off of likely exceeding the temperature limit.

The emissions budget and global mean surface temperature are approximately linearly related. Therefore, a given temperature target such as 2°C translates into a long-term emissions budget. In its fifth assessment in 2014, the Intergovernmental Panel on Climate Change estimated how much carbon dioxide could be emitted to keep the global average temperature rise over pre-industrial levels to no more than 1.5°C, 2°C or 3°C. The last could be catastrophic.



Source: UNEP, 2019c.

*Data from The Global Carbon Project.

been translated into concrete long-term strategies to cut emissions (UNEP, 2019a).

INTENSIFYING WARMING

Human-induced warming reached approximately 1°C above pre-industrial levels in 2017, after increasing at a rate of 0.2° per decade.

Warming greater than the global average has already been experienced in many regions and seasons, with higher average warming over land than the ocean. The current global temperature is mostly the result of carbon dioxide emitted over past decades. The inertia of the carbon and climate cycle means that even if fossil fuel emissions were to suddenly cease, some continued warming would be expected.

Poverty and disadvantage are expected to increase in some populations as global warming intensifies, particularly among already vulnerable populations. The world is at a critical point where policymakers need to take ambitious measures to constrain warming and adapt to its consequences.

Trends in biodiversity and ecosystem services

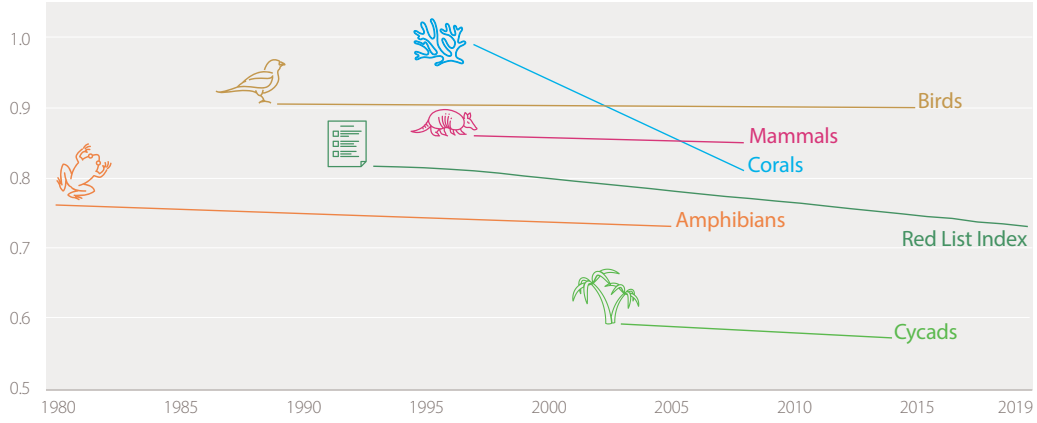
Human-induced environmental change – shifts in land and sea use, unsustainable food systems, exploitation of species, pollution and climate change – drives global declines in all dimensions of biodiversity, from genetics to species to entire ecosystems, with ramifications for their stability and functioning.[2] Climate change is likely to become the dominant driver of biodiversity changes in the coming decades. Increasingly rapid declines in ecosystem functions are projected to continue to 2050 and beyond if major policy reorientations are not pursued (IPBES, 2019).

MOUNTING THREATS TO BIODIVERSITY

All of the earth's systems are, ultimately, determined by interaction between all living organisms (the biosphere) and non-living physical systems. Biodiversity has a critical role in in maintaining conditions (or planetary boundaries) that support humanity (GSDR, 2019).

On average, 25 per cent of species in assessed animal and plant groups are threatened (figure 2.1). Around 1 million species face extinction, many within decades, without actions to reduce biodiversity loss. Land-use

FIGURE 2.1 DIVERSE SPECIES ARE ON THE DECLINE



Source: GSDR, 2019.

Note: The Red List Index shows trends in overall extinction risk for species, with extinction at an index of zero.

2 This section draws heavily on UNEP 2019c and IPBES 2019.

changes due to expanding agriculture and unprecedented urban and infrastructure growth are primary causes of declines in terrestrial species. Yet biodiversity in agricultural settings is key to food and nutrition security. Pollination by insects, birds and mammals accounts for 35 per cent of global crop production, for example, and up to 15 per cent of the value of cash-crop economies (CBD, 2013). Moreover, wider encroachment of human settlements into natural forests and habitats drives increasing zoonosis, or the transmission of diseases from animals to humans (box 2.2). Overall, increased trade and human population dynamics have put a fifth of the earth's surface at risk of invasive plants and animals, which are notorious disrupters of ecosystems.

SHRINKING FRESHWATER SYSTEMS AND WETLANDS

Of all ecosystem types, inland water and freshwater ecosystems show among the greatest rates of decline. This is perhaps due to the high human use of ecosystems such as marshes, swamps, peatlands, wetland forests, rivers, lakes, ponds and headwaters. They are exposed to the full spectrum of anthropological pressures, including land-use change, habitat loss, invasive species and infrastructure development. Dam building and water diversion have fragmented rivers and caused wetland habitat losses and degradation. Pollution via nutrient overload, plastics and chemicals drives declines in wetland flora and fauna species (UNEP, 2019c).

BOX 2.2 EMERGING ZOONOTIC DISEASES

The COVID-19 pandemic has caused profound shocks to economic activity, social relations, public health, trade and national relations (Baldwin and Weder, 2020). Around 60 per cent of all infectious diseases in humans are zoonotic, or come from animals.

Zoonotic disease is closely linked with the health of ecosystems. Addressing it requires understanding the impact of human activities upon ecosystems, and the ways in which these interactions influence zoonosis, including through human-ecological dysfunction (UNEP, 2016a).

The risk of viral emergence is increasing largely due to human-induced environmental changes such as forest cover conversion and other land-use shifts. This increases the extent of ecotones, areas of intersection between two different ecosystems, or human settlements and other biological communities. Ecotones now dominate much of the world's tropical ecosystems in developing regions. Here, land-use change and forest conversion have escalated at historically unprecedented rates over the last three decades. Added pressures come from climate-driven shifts in ecotones, which will likely raise infectious parasitic diseases in wildlife, increasing the risk to human communities (Despommier, Ellis and Wilcox, 2006; Svobodova et al., 2004; Jones et al., 2013).

Development can be a double-edged sword. Selective logging, building roads and other infrastructure results in deforestation and the fragmentation of habitat, which increases contact between wildlife and humans. Though roads can improve access to health care for rural communities, the increased contact between remote and urban populations may enable a localized outbreak of disease to spread rapidly, even reaching pandemic proportions (Nasi et al., 2008).

Peatlands cover just 3 per cent of the earth's surface, but potentially store more carbon than all the world's forests combined. Draining and slow combustion of these ecosystems causes at least 2 billion tonnes of carbon dioxide emissions yearly, equivalent to approximately 5 per cent of annual global carbon emissions. The thawing of the permafrost in boreal peatlands in and around the Arctic Circle, driven by climate change, is also increasing carbon emissions.

Healthy, resilient freshwater ecosystems are crucial for providing fresh water to human societies. Continued degradation deters progress on SDG 6, on clean water and sanitation. Increasing scarcities are due to population growth, socioeconomic development, changing consumption patterns and desertification caused by climate change.

Groundwater comprises a much larger volume of fresh water than surface water, and is increasingly important for water security in many countries and regions. But poor management of some subregional and regional aquifers is resulting in unsustainable extraction, pollution and saline intrusion. The last will worsen as climate change raises sea levels, especially in vulnerable low-lying island states. In most regions, water quality has worsened significantly from organic and chemical pollution linked to the improper management of wastewater, with rising amounts of untreated sewage, agricultural runoff and industrial discharge.[3]

PROFOUND PRESSURES ON MARINE AREAS AND COASTS

The ocean regulates temperature and precipitation, both vital functions. Its capacity as a carbon sink is immense. Since pre-industrial times, it has absorbed some 40 per cent of total carbon dioxide emitted. Projected changes in the ocean, however, are expected to impact the biosphere in ways that will exacerbate global warming (GSDR, 2019).

Mostly due to anthropogenic effects, Arctic warming is occurring twice as fast as the global average. Under most climate scenarios, the Arctic is projected to be ice free by the summer of 2050. This will cause major ecological shifts, continued species decline, and altered fishing and hunting conditions for indigenous populations. The potential for conflict will increase, especially if new fishing zones are opened, and oil and gas interests continue to pressure the biome. Large-scale negative impacts will be felt on marine protected areas, and in terms of economic use, cultural interests and governance.

Coastal marine ecosystems are particularly hard hit by human activities, with pressures from habitat destruction, aquaculture and invasive species. Mangrove forests and seagrass habitats have declined rapidly all over the world. Live coral cover on reefs has nearly halved in the past 150 years, with the drop-off accelerating over the past two to three decades due to increased water temperatures and ocean acidification (IPBES, 2019). The two factors combined impose massive stress on coral reef ecosystems that reduces growth, increases bleaching and curtails the function of reefs as protectors

3 Globally, 80 per cent of wastewater flows back into ecosystems without being treated or reused (Sato et al., 2013). As a result, around 1.8 billion people use a source of drinking water contaminated with faeces, putting them at risk of contracting cholera, dysentery, typhoid and polio, among other diseases.

during storms (GSDR, 2019). The destruction of coral reefs has devastating consequences for biodiversity because they provide habitat for around 25 per cent of all oceanic species.

The loss of mangroves deprives coastal communities of critical resilience and buffering services. Where mangroves thrive, they lessen the impacts of storms, prevent coastal erosion and flooding, and enhance the abilities of households, particularly in poor communities, to recover from extreme weather events. For many tropical and subtropical countries, including small island developing states, both reefs and mangroves are vital for economic activity and coastal protection (GSDR, 2019).

Overexploitation of marine species has become a matter of urgent concern, affecting 33 per cent of fish stocks globally by 2015 (IPBES, 2019). Aquaculture has helped to reduce pressures on wild species, but can spread disease and invasive species, interspecies breeding and eutrophication (UNEP, 2019c).

CONTINUED DECLINE IN GRASSLANDS AND FORESTS

The net rate of global forest loss has halved since 1990, yet tropical forests rich in biodiversity continue to decline, reaching approximately 68 per cent of the estimated pre-industrial level. In more developed regions in particular, planted forests have grown by 3.2 million hectares per year, and by 2015, accounted for 7 per cent of global forest area. Key ecosystem services provided by all forests include climate regulation through carbon sequestration, the protection of soil and water, the provision of clean water and habitats for biodiversity. Planted forests are far less biologically diverse, however, and do not contribute the same quality of ecosystem services (Taki et al., 2011).

As deforestation and degradation march forward, forest ecosystems can transform quickly from net carbon sinks to carbon emitters. The Amazon, for instance, having lost 17 per cent of its size in the last 50 years, now absorbs a third less carbon than it did a decade ago (World Economic Forum, 2020b). The main driver of tropical deforestation in South America remains commercial agriculture, responsible for around 70 per cent of forest losses (FAO, 2016).

The boreal forest has the largest store of terrestrial carbon, over 75 per cent of which is in soil organic matter, accounting for 20 per cent of the annual terrestrial forest carbon sink. Not all boreal forests are sinks, given an increase in fires and respiration due to climate change. Temperate forests have expanded by about 67 million hectares since 1990, largely due to planting in China and farm abandonment globally.

Trends in natural capital

Natural capital comprises forests, fossil fuels, fisheries, agricultural land, rivers and estuaries, oceans, the atmosphere, ecosystems and subsoil resources (UNEP, 2019e). Current accounting methods for natural capital encompass subsoil non-renewable resources, forests, fisheries and agricultural land, but should also include ecosystems. The United Nations Environmental Assembly suggests that "natural capital and natural resource valuation and accounting mechanisms can help countries to assess and appreciate the worth and full value of their natural capital and to monitor environmental degradation".[4] Measuring

4 Resolution UNEP/EA.2/Res.13 (UNEP, 2016c).

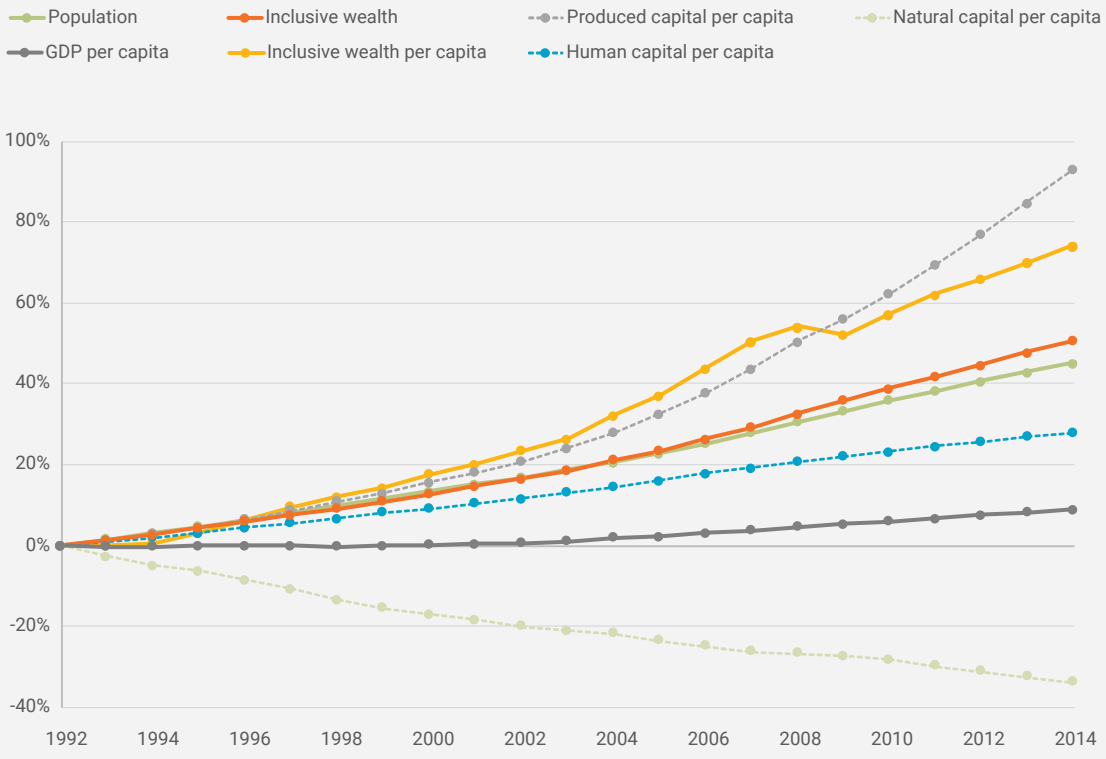
biodiversity and natural capital enhances accountability and facilitates monitoring progress on the SDGs and environmental change.

NATURAL CAPITAL THROUGH THE LENS OF INCLUSIVE WEALTH

Figure 2.2 shows trends in inclusive wealth, disaggregated by capital type. Global changes in human and produced capital have been largely positive, with particularly strong improvements for produced capital per capita. Natural capital per capita, by contrast, has significantly declined since 1992.

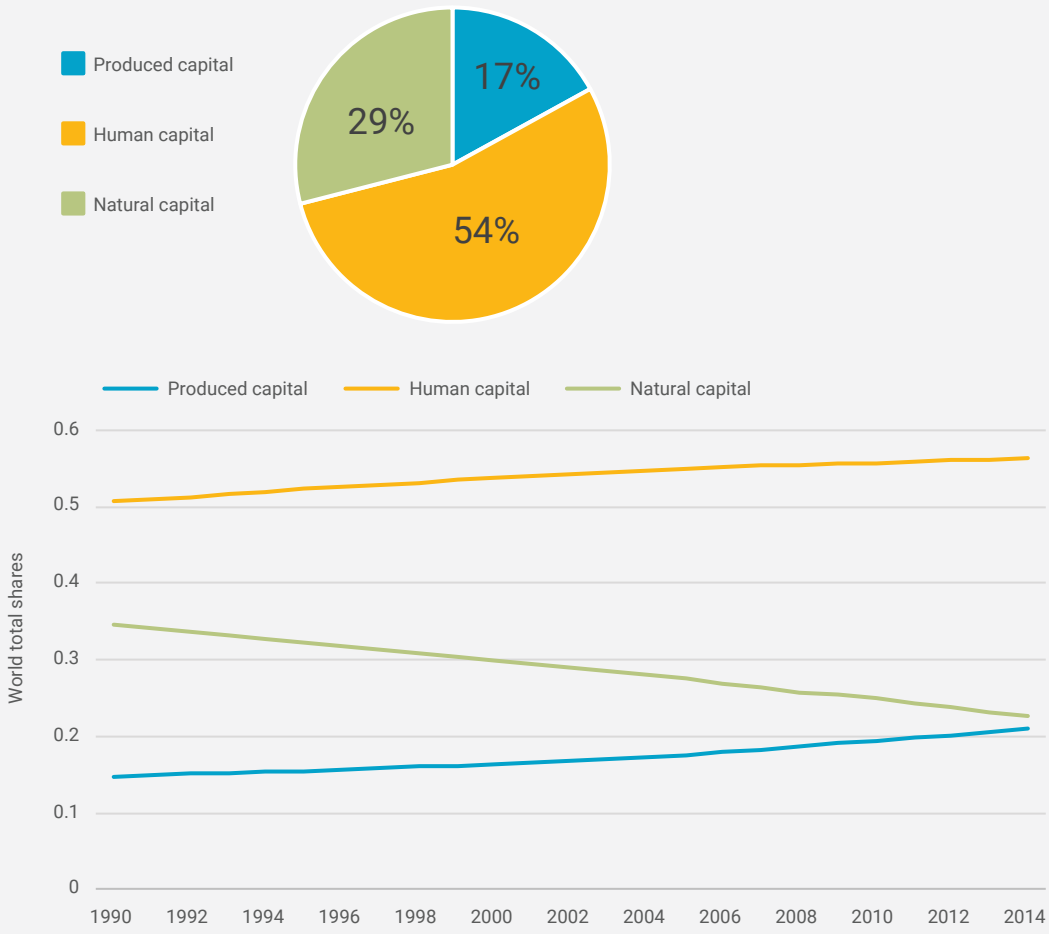
Natural capital is an important source of wealth in Central Africa, South America and Western Asia. It is the most important source of wealth for 21 countries, more than three-quarters of which are low- or middle-income economies. Although produced capital has grown impressively, potential in health, education and natural assets is not being realized (figure 2.3). An intuitive interpretation is that produced capital and, to a lesser extent, human capital have been enhanced at the cost of natural capital.

FIGURE 2.2 GLOBAL TRENDS IN PER CAPITA INCLUSIVE WEALTH, 1992–2014



Source: UNEP, 2019e.

FIGURE 2.3 WORLD AVERAGE SHARES OF CAPITAL



Source: Managi and Kumar, 2018.

Looking at global wealth composition over time yields an interesting observation. Produced capital has largely become a substitute for natural capital, although human capital continues to account for more than 50 per cent of total wealth (UNEP, 2019e). This highlights the importance of including natural capital in accounts of wealth (box 2.3). Given that stocks of natural resources are being depleted to produce and accumulate wealth, any measure that excludes natural capital depreciation will likely exaggerate the increase in an economy's wealth over time, especially in countries where accumulation of other forms of wealth is failing to compensate for diminishing natural capital. Only 31 of 140 countries have experienced positive growth in natural capital. Ninety-two countries have reported a decline in fishery wealth, which is particularly concerning given the large proportion of people who rely on fish for dietary protein (UNEP, 2019e).

BOX 2.3 THE ENVIRONMENT AS NATURAL CAPITAL

It is only relatively recently that natural capital, the assets of the biophysical world surrounding us, has been recognized alongside manufactured, human and social capital as part of the capital stock of wealth necessary for continued economic production. Though the fourth stage of the industrial revolution has driven productivity and efficiency to new levels, the quantity and quality of natural capital continues to decline. This is particularly problematic for the Amazonian, South Asian and sub-Saharan African regions, where many people still face extreme poverty and directly rely upon common water bodies, grazing land and biodiversity to survive.

The stock of natural capital includes both renewable and non-renewable resources. The depreciation and degradation of natural capital, and thus the overall stock of all types of capital in the economy, are intricately linked to the management of natural resources, particularly non-renewable natural resources and land-use planning.

Calculating the value of natural capital

Total natural wealth is estimated by multiplying the measured physical amount available by the corresponding shadow prices (rents) of the resources, a relatively common accounting method to value natural resources (see box on the shadow price). For natural capital, the shadow price denotes the marginal contribution it makes to social well-being. The price changes with the contribution of natural capital to social well-being, increasing as natural capital becomes scarcer. Besides the supply effect, there may also be a demand effect, which may be particularly significant during the energy transition away from fossil fuels (Dasgupta, 2015).

Using shadow prices

The calculation of shadow prices is central to developing natural and human capital accounts. Simply put, a shadow price is the estimated price of a good or a service that does not have a market price. Various non-market valuation techniques can be used to estimate these prices, which are a more comprehensive measure of value than unadjusted market prices.

Using shadow prices as inputs into social cost-benefit analysis – especially prices for natural capital – has attracted much criticism, mainly given major knowledge gaps regarding the production functions of life-supporting natural systems. Although the "right" shadow prices of natural capital or ecosystem services may fail to fully capture their value, however, shadow prices based on a measure of the willingness to pay are currently considered the best approach (Dasgupta and Duraiappah, 2012; Farley, 2012).

Although shadow prices are defined as the marginal changes when there is a hypothetical, small perturbation in capital assets, for short-term sustainability tracking, it is sufficient to use average shadow prices that remain within the studied period. For a significant perturbation, however, such as the implementation of a large project, a natural disaster or a financial crisis, the change in shadow prices must be accounted for even within a short period.

The System of Environmental-Economic Accounting

A natural capital accounting framework for the environment and ecosystems and their relationship to the economy is the System of Environmental-Economic Accounting. It provides a statistical framework for measuring links between the environment, and economic and societal well-being.

The system uses the same accounting approach, concepts and classifications as the System of National Accounts (SNA). It allows official statistics to go beyond gross domestic product (GDP) and cover the environment-economy nexus. Monetary values, based on exchange values, complement SNA monetary values, and can be used to help analyse the contribution of natural capital to the economy, or to compare the costs of ecosystem degradation with increases in economic output.

With its comprehensive scope, the System of Environmental-Economic Accounting is well placed to support the 2030 Agenda. It offers scope for informing 40 SDG indicators under nine different goals (Hein et al., 2020).

Trends in waste and pollution

A GROWING TIDE OF MUNICIPAL SOLID WASTE

Waste generation per capita has risen markedly over the last 50 years. It is closely and positively correlated with national income. Cities generate between 7 billion and 10 billion tonnes of waste per year, and this is expected to rise, even double, in lower-income African and Asian cities by 2030.

There has been some progress in reducing rates of uncontrolled waste disposal, which is crucial for addressing pollution, though the degree of improvement seems somewhat stratified by level of development. The 100 per cent and 95 per cent controlled disposal rates in high and upper-middle-income countries, respectively, are in stark contrast to low-income countries with rates well below 50 per cent, and even 0 per cent in rural areas of developing countries where open burning is common.

WORSENING AIR POLLUTION

Urban areas suffer from air pollution that often exceeds the World Health Organization (WHO) guideline for annual average concentrations of fine particles (2.5PM) known to be dangerous to human health. The difference between low- and middle-income countries and high-income countries is notable, with 98 per cent and 56 per cent of cities, respectively, exceeding the WHO guidelines (UNEP 2019c; Cheng et al. 2016). The COVID-19 pandemic resulted in globally significant reductions in emissions due to temporary cessation of non-essential transport and some emissions-heavy industries such as manufacturing (box 2.4).

BOX 2.4 COVID-19 LOCKDOWNS CLEAR THE AIR

Across the globe, statistically significant declines in air pollutants have come from COVID-19 lockdowns, namely, lower levels of nitrogen dioxide (emitted by burning fossil fuels) and small particulate matter. Nitrogen dioxide pollution fell by an average of 40 per cent over cities in China, and by 20 to 38 per cent over Western Europe and the United States of America during 2020 lockdowns, compared to the same time in 2019 (Berman and Ebisu, 2020). In addition, the contraction of aviation and industrial activity resulted in a notable fall-off in carbon emissions globally.

This unintended opportunity to observe air pollution patterns related to human activity and lockdowns will be invaluable for greater understanding of how regulations of air pollutants and greenhouse gas emissions may impact air quality and climate change.

The decreased intensity of human activity also led to environmental improvements of other kinds, such as reduced noise pollution, and more wildlife frequenting urban areas, rivers and canals. On the flip side, more waste – such as disposable masks, medical and biohazardous waste, antibacterial soaps and gels, and single-use items – has increased pollution in water and on land (Zambrano-Monserrate and Ruano, 2020).

Air pollution is the largest contributor to the global environmental burden of disease, associated with between 6 million and 7 million premature deaths annually. Each year, 600,000 children die because of air pollution. Exposure to dirty air can harm cognitive and motor development, and put children at greater risk for chronic disease later in life. Women and girls are disproportionately affected, particularly in developing countries, where they may spend significant time at home exposed to pollution from solid fuels or kerosene used in cooking, heating and lighting.

The relative contributions to air pollution from power plants, large industrial facilities and vehicles have decreased with tighter regulations, though this trend differs markedly by region. Rapidly rising vehicular traffic in the growing cities of Africa and Asia is a major source of air pollution, alongside agriculture, the burning of fuel for domestic purposes, construction, artisanal manufacturing and wildfires (OECD, 2016).

SKYROCKETING PLASTIC WASTE

The production of plastics has skyrocketed from 1.5 million tonnes in 1950 to 204 million tonnes in 2002 and 299 million tonnes in 2013. Between 3 million and 5.3 million tonnes of micro- and macroplastics, respectively, end up in the environment each year. Marine litter associated with plastic pollution is one of the most difficult global waste and resource management challenges, with a tenfold increase in marine plastic pollution since 1980 (IPBES, 2019). Plastic waste constitutes 60 to 80 per cent of marine debris, and converges in high concentrations in ocean currents. It negatively affects at least 267 species, including 86 per cent of marine turtles, 44 per cent of seabirds and 43 per cent of marine mammals (IPBES, 2019; UNEP, 2019a; GSDR, 2019).

FAST-GROWING ELECTRICAL, CHEMICAL AND HAZARDOUS WASTE

Waste derived from electronics, or "e-waste", is the fastest-growing waste stream globally, a trend attributed to increased consumer demand, built-in and perceived obsolescence, and rapid inventions of new electronic devices. An estimated 41.8 million tonnes of e-waste were generated in 2014, almost 25 per cent more than in 2010 at 33.8 million tons. Most of this waste was generated in Asia, but by per capita measures, Europe has the highest figure at 15.6 kilogrammes per person. Africa has the lowest at 1.7 kilogrammes per person. E-waste pollutes soil and adversely affects air and water quality through toxic chemical seepage into groundwater, and toxic chemicals released to the atmosphere when e-waste is warmed (GWMO, 2016).

In 2017, the global chemical industry exceeded $5 trillion in value, with consumption and production rapidly increasing in emerging economies. As global supply chains and the trade of chemicals and products become increasingly complex, hazardous chemicals and other pollutants (e.g., pharmaceutical waste) continue to be released in large quantities. They are accumulating ubiquitously in material stocks and products. Chemical pollution threatens a range of ecosystem services and natural systems, as well as human health. These risks justify moving swiftly towards a circular economy, and sustainable consumption and production models that draw on rapidly evolving technology and innovation (box 2.6) (GCO II, 2019).

Complex drivers, closely interlinked

The forces propelling environmental change are strongly intertwined and complex, and spread widely and unevenly across the world. The latest Global Environmental Outlook (UNEP, 2019c) acknowledges five main drivers: population growth, climate change, economic growth, technological change and urbanization. These may exert both positive and negative forces on the environment, and carry an interdependence that itself can be positive or negative. The relative importance of each driver and associated stressors has varied impacts across environmental systems and dimensions.

Population and economic growth have been major causes of environmental change. In the past 50 years, the human population has doubled, the global economy has grown nearly fourfold, and global trade has grown tenfold, together ramping up demand for energy and material goods, and the resources to produce them. Without profound and system-wide changes in consumption and production patterns, we will not be able to support the 10 billion people expected to inhabit the earth by 2050.

POSITIVE AND NEGATIVE INTERACTIONS

Aggregate interactions of the five drivers are negative in terms of climate change. Technological advancements and continuing urbanization, however, will crucially determine whether the other megatrends explored in this chapter (biodiversity and ecosystems, natural capital, and waste and pollution) will catalyse negative or positive transformation (UNEP, 2019d).

Technology has accelerated economic development and lifted living standards in both developed and developing countries, but challenges persist in ensuring the equitable diffusion of sustainable technologies to developing countries. Technology can simultaneously act as the main driver of climate change, unsustainable patterns of resource and energy use, and pollution and waste. The unintended consequences and rebound effects of technology make it difficult to determine whether new advances may have long-term positive and/or negative impacts.[5]

The influence of urbanization on sustainable development can also be both positive and negative. It offers huge efficiency gains in production, and massive economies of scale and agglomeration, including in the delivery of key public services, such as health care and education. It presents opportunities for increasing citizens' well-being while decreasing their individual ecological footprint (UNEP, 2019c). But urbanization also greatly expands resource and energy use, and generates rising greenhouse gas emissions that feed climate change as well as huge amounts of waste and pollution. It intensifies diverse aspects of inequality. Serious social and environmental challenges remain unsolved in many urban areas, particularly in Africa and Asia, in which 90 per cent of the growth in cities by 2050 will take place (UNEP, 2019c).

Climate change is an independent driver of environmental change via its influence on various

5 The rebound effect refers to the possibility that the expected net gains in resource efficiency from new technologies can also be reduced by induced system-wide changes in behaviour that may lead to increased resource use. For example, lithium batteries are a crucial enabler in efforts to decarbonize energy and transport systems, but their increased production raises demand for cobalt mined primarily in the Democratic Republic of the Congo under conditions that pose human rights risks (adverse working conditions and child labour), lack transparency and undercut sustainable development in the country (World Economic Forum, 2019).

natural systems and exacerbation of other causes of change in natural systems and biodiversity (IPBES, 2019). It has become a major source of local species loss and extinction, with significant differences in projected extinction rates even between warming levels of 1.5°C and 2°C. Species losses of insects, plans and vertebrates are projected to be two to three times higher under a 2°C scenario than a 1.5°C scenario. Other biodiversity-related factors like forest fires, extreme weather events, and the spread of invasive species, pests and diseases would be exacerbated by a 1.5°C increase, but even more so with warming of 2°C (IPCC, 2018).

LAND-USE CHANGES LEAD TO MULTIPLE LOSSES

The main driver of forest loss in tropical and subtropical regions is land-use change. While other subdrivers vary in importance among and within regions, globally, land-use change accounts for 40 per cent of deforestation (IPBES, 2019). Agricultural expansion is the most widespread form of land-use change, with over one third of terrestrial land surface used for cropping or animal husbandry. Agriculture alone, especially large-scale commercial agriculture (e.g., cattle ranching, oil palms, soy and cocoa) accounts for over 70 per cent of deforestation in tropical and subtropical countries (Lawson et al., 2014). Changing climate conditions create uncertainty in production and farmers' incomes. Producers may expand their area of production to secure sufficient revenues.

Land degradation – through soil erosion, salinization, contamination, organic matter decline, forest fires and overgrazing – is a growing problem for grasslands and agricultural production, often resulting in land conversion in adjacent land. Some 29 per cent of global land area has been degraded over the last three decades. This is leading to the decline of ecosystem services,[6] and reductions in microbiological activity, water retention capacity and soil resistance. Monocultural farming systems and other intensive agricultural practices are often associated with environmental degradation and loss of biodiversity (UNEP, 2019c).

Mined products contribute more than 60 per cent of GDP in 81 countries. All mining on land has increased dramatically, and demand for several key metals and minerals is expected to grow significantly over coming decades, including for greener energy technologies (IRP, 2019). While still using less than 1 per cent of the earth's land, mining has had significant negative environmental and social impacts, including the degradation and loss of biodiversity and ecosystems, emissions of highly toxic pollutants, reduced air and water quality, unequal water distribution, socioenvironmental conflict, and negative consequences for human health and livelihoods (IPBES, 2019).

Extensive areas of the planet are under threat from expansions of infrastructure. Globally, paved roads are projected to increase by 25 million kilometres by 2050; nine tenths will be within least developed and developing countries. The number of dams has risen rapidly in the past 50 years. Globally, there are now about 50,000 large dams (higher than 15 metres) and 17 million reservoirs (larger than 0.01 hectares or 100 square metres). Many developing countries continue to construct dams to secure domestic water supplies

6 Analysis by the Economics of Land Degradation Initiative shows that ecosystem service value has decreased globally by $20.2 trillion per year since 1997 as a result of land-use and management changes. The dollar value of ecosystem service value lost from land degradation is roughly 50 to 75 per cent of the dollar value of losses from land cover changes over the last 15 years (ELD, 2015).

for communities, agricultural irrigation and hydroelectric power generation (UNEP, 2019c).

GREATER RISKS FOR VULNERABLE PEOPLE

Climate change as a key driver of environmental change will generally amplify existing risks and create new ones for ecological and socioeconomic systems. These risks are likely to be unevenly distributed, most deeply affecting disadvantaged people. This is true for both developed and developing countries (UNEP, 2019d). Interlinkages between environmental decline and inequality are numerous, complex and bidirectional.

Growing evidence suggests that a more equal distribution of economic resources within countries may help to ameliorate environmental threats. This can reduce the overconsumption of the rich and lessen the need for the poor to engage in environmentally harmful activities to make a living. Diminishing inequality in both income and opportunity requires better conservation of natural capital, underscoring the imperative of bringing national policymaking on inequality into an overarching framework that includes environmental considerations (box 2.5).

Low-income countries are more directly exposed to the negative impacts of environmental degradation. As climate change-induced natural disasters occur more frequently and at higher intensity, the fallout is again disproportionately felt in poorer countries, which exacerbates inequalities among countries. Mortality rates from disasters in low- and middle-income countries are four to five times higher than those in high-income countries (ESCAP, 2018).

BOX 2.5 INEQUALITY INTERSECTS WITH NATURAL RESOURCES

The current global pandemic and its lockdowns are exacerbating existing inequalities among and within countries. The World Bank has projected that roughly 71 million people globally will be pushed into extreme poverty, assuming COVID-19 does not change inequality within countries or national growth accumulates equally for everyone. Sub-Saharan Africa and South Asia are anticipated to be the hardest-hit regions, with 26 million and 32 million people in each region, respectively, projected to be living on $1.90 or less a day (The World Bank, 2020).

Inequality puts stress on natural resources through overuse and overexploitation, and can add to climate change (ESCAP, 2019). Several organizations, such as the United Nations Development Programme, World Data Lab and UNDESA are working on an inequality index that includes natural capital or natural resources among and within countries.

Small island developing states are already very clearly experiencing the negative impacts of sea-level rise, with saltwater intrusion threating agricultural productivity through the irreversible salinization of croplands. Altered and unpredictable precipitation patterns will severely compromise the resilience of agriculture, particularly in sub-Saharan African countries where it is largely rain-fed (IPCC, 2007). Multiple and compounding stresses make Africa one of the regions most vulnerable to climate change. These include endemic poverty, complex governance, and limited access to capital, markets, infrastructure and technology.

Beyond inequality among countries related to environmental and climate changes, there is evidence of inequalities within countries. Almost 40 per cent of disaster impacts hit health, education and livelihoods, deepening disparities in opportunity that are transmitted over generations. This creates a vicious cycle of poverty, and inequalities of income and opportunity (ESCAP, 2019). Groups with high exposure and vulnerability to drought, and low levels of human development, such as smallholders in marginal agriculture, are likely to be left furthest behind when disaster strikes (ESCAP, 2019).

Alongside monetary poverty, there is acute multidimensional poverty, in which households are deprived on one third or more of 10 indicators of health, education and living standards set by the SDGs (Alkire et al., 2020).[7] Acute multidimensional poverty makes disadvantaged groups suffer a disproportionate loss of their income and assets, subsequently resulting in greater inequality. This can occur through increased exposure to climate hazards, increased susceptibility to damage caused by climate hazards, and a decreased ability to cope with and recover from the damage (UNDESA, 2017).

COMMODITY DEPENDENCE POSES UNCERTAINTIES IN A CHANGING CLIMATE

There is a close, two-way relationship between climate change and commodity production, transportation, processing and consumption. On one hand, the burning of fossil fuels, agricultural production and mining operations are jointly responsible for the majority of anthropogenic greenhouse gas emissions. On the other hand, climate change has important consequences for commodity value chains. For instance, oil, gas and coal upstream supply chains are vulnerable to disruptions, delays and downtimes, and rising operational costs from climate-related rapid-onset events such as floods and storms, and slow-onset effects such as sea-level rise. Agricultural production and productivity are deeply affected by variations in heat and rainfall patterns associated with climate change. Extreme weather events, the risk of which is likely to rise with global temperatures (IPCC, 2014), also cause major damage to agriculture, and pose threats to mining infrastructure and operations.

Commodity-dependent developing countries face specific and disproportionate risks.[8] While their per capita greenhouse gas emissions are significantly lower than those of the main emitters (figure 2.4A), they are among the countries most vulnerable to climate change (figure 2.4B). Exacerbating this vulnerability is the fact that commodity dependence is more prevalent among poorer countries. For instance, 85 per cent of the least developed countries depend on commodities, a much higher share than the 64 per cent of all developing and transition economies (UNCTAD, 2019a).

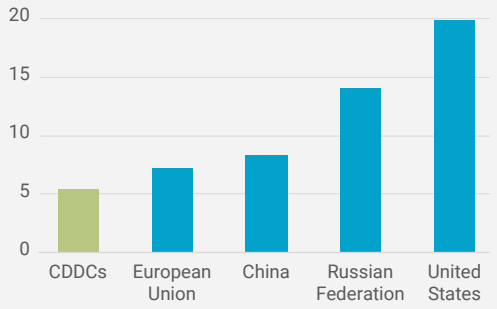
Commodity-dependent developing countries are vulnerable to two sets of climate-related impacts. In addition to direct impacts from climate change on commodity value chains, the rapid decarbonization of the global economy, required to reach the objectives of the

7 The indicators include: when a household has any malnourished member, high child mortality, no one in the family has completed six years of education, children do not attend school, a lack of clean drinking water, a lack of nourishing food, a lack of improved sanitation and/or a lack of adequate and safe housing.

8 Commodity-dependent developing countries derive more than 60 per cent of their merchandise export revenue from primary commodities.

FIGURE 2.4A

Anthropogenic greenhouse gas emissions per capita, including land use, land-use changes and forestry, 2014 (tCO_2e)

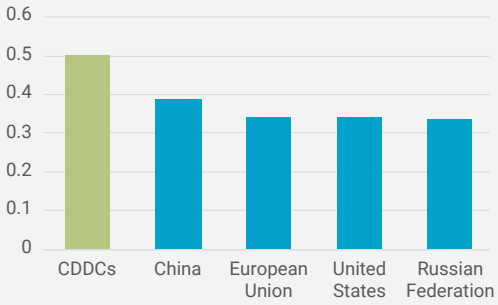


Source: Based on data from www.climatewatchdata.org.

Note: Data were not available for South Sudan and Timor-Leste. tCO_2e stands for tons of carbon dioxide equivalent.

FIGURE 2.4B

Climate change vulnerability score, 2017



Source: Based on the vulnerability score of the ND-GAIN Index, gain.nd.edu/.

Notes: The figure shows simple averages for country groups; data were not available for the following commodity-dependent developing countries: Kiribati, Nauru and Palau. CDDC stands for commodity-dependent developing countries.

Paris Agreement, poses severe economic risks for countries that rely on fossil fuel exports. The majority of these are commodity-dependent developing countries. Keeping the rise in global temperatures below 2°C is not consistent with burning all known reserves of oil, gas and coal. Successful implementation of the Paris Agreement will require leaving aside significant fossil fuel reserves (Leaton et al., 2013), which is potentially an existential challenge for some countries.[9]

Climate change also has effects upon agriculture and forestry. For example, in Brazil, climate change could reduce the area suitable for growing soybeans by 15 to 28 per cent by 2030 (Assad et al., 2013). Costs associated with so-called stranded assets and resources will likely include limitations on funding the SDGs in commodity-dependent countries.

GENDER EQUALITY AS A MULTIPLIER OF SUSTAINABILITY

There are well-established links between environmental issues and gender, with gender equality and women's empowerment affirmed as multipliers of sustainability. Women and men often have different vulnerabilities to environmental degradation and hazards, and this may yield varying perspectives on the extent and seriousness of these problems, and the best solutions.

Defining dynamics within households, including between women and men, is critical to fully understanding local environmental behaviour and its outcomes (Seager, 2014). Women and children are more exposed to indoor air pollution from cooking with fuels such as charcoal and wood. As the majority of water carriers, women and children not only spend a substantial

9 Stranding can occur due to new regulations aimed at reducing greenhouse gas emissions (regulatory stranding), changes in relative prices between renewable and fossil energy sources (economic stranding) or physical drivers such as climate-related impacts or risks (physical stranding).

amount of time and physical energy fetching water, but also risk injury and assault.

In many societies, women have traditionally been the keepers of rich knowledge about plants, animals and ecological processes. The erosion of biodiversity driven by industrial agriculture has therefore had specific impacts on women, including losses of knowledge related to seeds, processing and cooking. By one estimate, eliminating gender inequality in access to land resources could boost agricultural output by 2.5 to 4 per cent (IFPRI, 2016).

Women's roles in creating environmental movements have been recognized since the 1970s. Indigenous communities around the world, led particularly by women (in Amazonia, the Navajo Nation, Papua New Guinea, the Philippines, etc.) have mobilized to protect their land from extractive industries. The Chipko movement in India has protected forests for essential livelihoods since 1973. In 1981, the Greenham Women's Peace Camp protested against nuclear bombs, attracting support from Pacific Islander women who had experienced atomic bombings tests. In Kenya, Nobel Laureate Wangari Maathai launched the Greenbelt movement to safeguard the Karura forest, a symbol of controversial land-grabbings in Kenya (UNEP, 2016b).

ENVIRONMENTAL LOSSES LEAD TO HUMAN DISPLACEMENT

The least developed countries, often rich in and more dependent on natural resources, have suffered the greatest degrees of land degradation, which in turn has spurred the outward migration of several million people. These countries have also experienced more conflict and lower economic growth. Where people are unable to adapt to environmental changes, whether incremental or due to natural disasters, they will seek to migrate or find refuge elsewhere.

Forced displacement due to climate change is becoming increasingly common. People living in climate change "hotspots" may be forced to move as crops and livestock struggle due to changed or unpredictable precipitation (IOM, 2014). New displacement patterns and competition over depleted natural resources can spark conflict between communities and/or compound pre-existing vulnerabilities.

UNEQUAL SUSCEPTIBILITY TO THE ENVIRONMENTAL BURDEN OF DISEASE

The environmental burden of disease is an important facet of inequality. Nearly half of all people in Asia and the Pacific still rely on traditional and inefficient fuels for cooking and heating, which has detrimental effects on human health (ESCAP, 2018). When flooding occurs and increases in intensity, the most vulnerable groups suffer most from associated outbreaks of disease. Infectious diseases are climate-sensitive and represent a large share of the current global burden of disease, spreading through unclean water and food, and vectors such as mosquitoes.

INDIGENOUS PEOPLE, LAND TENURE AND BIO-PROSPECTS

At least a quarter of global land area is traditionally owned, managed, used or occupied by indigenous peoples. Only about 10 per cent of formal land rights are registered or recorded worldwide, however. And since 2000, 26.7 million hectares of agricultural land have been transferred to the ownership of foreign investors.

Indigenous peoples, the impoverished and women are among the groups most vulnerable to unequal land ownership and access (UNEP, 2019c). Nature is generally declining less rapidly on lands of indigenous peoples than it is elsewhere, but it is nevertheless diminishing, as is knowledge of how to manage it (IPBES, 2019).

An important ecosystem service derived from biodiversity involves genetic resources to develop medicines and healing practices (Aguilar, 2001). Pharmaceutical profits in fact largely depend on the discovery and use of plants by indigenous peoples and local communities. Yet the economic benefits are not equitably shared. The Convention on Biological Diversity defines the sustainable use of biodiversity and the equitable sharing of benefits, particularly through access and benefit-sharing agreements. Such agreements recognize that bioprospecting frequently relies on indigenous or traditional knowledge, and that people or communities who hold such knowledge are entitled to a share of benefits arising from commercial use.

There has been a hesitation, and at times aversion, among some indigenous groups to apply Western intellectual property rights regimes to indigenous knowledge. A common sentiment is that patenting the genetic material of living organisms contradicts beliefs that all life forms and life-creating processes are sacred, and should not be subject to individual property rights and ownership (Tauli-Corpuz, 2005). Continued efforts to reconcile differing values and notions of benefit-sharing are required to effectively address associated human rights issues, and conserve the biologically diverse environments managed and inhabited by indigenous peoples.

Recommendations and policy responses

The COVID-19 pandemic has highlighted the interconnectedness of ecological and economic systems. Nations are seeking guidance on policies to nurture economic recovery while improving resilience to future novel disease outbreaks and other global shocks. In this context, the United Nations Secretary-General has indicated that nature and biodiversity will be integral to COVID-19 relief packages. The United Nations Environment Programme has revised its programme of work to place a central emphasis on links between human health and ecosystem health. Now, more than ever, the role of multilateralism and international coordination in supporting climate action and preventing environmental degradation is paramount.

The Convention on Biological Diversity, signed by 150 Member States at the 1992 Rio Earth Summit, is critical for shaping consensus on the use and protection of nature in ways that are sustainable and equitable. The Aichi Biodiversity Targets, which are central to the Convention, will expire in 2020 and be replaced with a longer-term 2050 strategy, the Post-2020 Global Biodiversity Framework. By guiding action, and synthesizing knowledge and experiences, such agreements have increased political and public support for improved international cooperation on environmental protection.

The Secretary-General has consistently highlighted the importance of the environment to issues such as inequality, gender, human rights and economic development. The focus has shifted from the idea that the environment is an externality, to a deeper understanding that the health of the biosphere is a precondition for social justice, development and sustainability. The SDGs reflect

this recognition, with specific objectives and indicators woven throughout all 17 Goals.

TOWARDS TRANSFORMATIVE CHANGE

The global scale and urgency of environmental challenges call for change far beyond incremental improvements in existing technologies and practices. We need transformation, which will necessarily entail profound shifts in how governments, businesses and markets respond to demands for energy and food, and material-intensive services. The risks and uncertainties associated with transformative change can be reduced if governments orient towards approaches that are integrated, inclusive, informed and adaptive.

Sectors across the economy need to incorporate environmental considerations within policy frameworks, moving past the ineffective practice of developing environmental policies in isolated silos. Examples of frameworks that support transformative change, such as culture shifts, technological evolution (box 2.6), nature-based solutions and the circular economy, are discussed on the following pages.

Sustainable development policy needs to be firmly rooted in a systems approach to analysis, which encompasses acknowledging the direct and indirect drivers of change, and realizing trade-offs should be minimized but are inevitable. This approach guides the identification of key policy entry points where one policy change within the system can stimulate desired changes across different sectors and facets of environmental resilience.

Successful transformational change requires commitment from the private sector, and the integration of impacts on nature in value chains and performance measurement of private enterprises and financial institutions. This involves taking into account impacts by firms as well as sectors and geographical locations, and redirecting funding towards nature-nurturing investments that support the SDGs.

Transformative change hinges on revising the indicators to track progress in economic development and human well-being. Since

BOX 2.6 THE POTENTIAL OF TECHNOLOGY TO MOVE THE NEEDLE

As a key driver of climate change, technological innovation holds potential to accelerate the harnessing of benefits from natural resources for human progress. State investment is crucial to reduce risk and encourage such innovations (UNEP, 2019c). Emerging technologies have the potential to move the needle on sustainable development by responding to its economic, social and environmental dimensions.

Technology may also be a tool to curb inequalities. As advanced countries become early adopters of frontier technologies, they should focus on potential synergies between preventing inequalities and improving the environment. South Africa promotes innovation in the mining industry and through the Biorefinery Industry Development Facility with national science, technology and innovation policies (UNCTAD, 2019b).

World War II, countries have tended to measure economic progress in terms of GDP. The system of national income accounting has serious flaws, but nothing is as serious as the asymmetry between produced and natural capital. Governments should invest in schemes to advance systems of national accounts to monitor changes in wealth, particularly the component of natural capital. While GDP provides a snapshot of productivity at a certain point, it cannot measure to what extent that productivity can be sustained long term. This is where wealth accounting can be extremely useful.

Leveraging the power of economic policy and financial flows will be integral to transformative change. Redirecting instruments beyond purely monetary or financial terms will be important. Investment in nature through economically derived frameworks for natural capital and ecosystem services can be helpful in this endeavour (GSDR, 2019).

CLIMATE CHANGE POLICY

The main multilateral forum for climate change action is the United Nations Framework Convention on Climate Change, with international treaties such as the Kyoto Protocol elaborating issues around participation, implementation, flexibility mechanisms and environmental effectiveness. Negotiations at the Convention's annual Conference of Parties are underpinned by the Intergovernmental Panel on Climate Change, which synthesizes the most recent and robust knowledge from academia on climate change trends, projects and impacts. The use of simple and consistent indicators of change, such as the volume of emissions and degrees of warming, makes it possible to monitor and compare progress on resolutions, and provide accessible summaries for policymakers.

Effective climate action entails both mitigation and adaptation to address the drivers of climate change and adjust to its impacts. Mitigation strategies are usually formulated with internationally agreed climate objectives in mind, and thus rely on international cooperation, though may deliver local benefits. Climate adaptation often focuses primarily on local and national outcomes, although its effectiveness can be enhanced through coordination across different levels of governance. Adaption strategies that are locally informed and implemented will be crucial for sustaining human well-being and resilience, and limiting risks such as migration propelled by climate- and environment-related causes.

The UN Climate Action Summit in September 2019 magnified political attention to the power of nature-based solutions for climate mitigation and adaptation. The term describes synergistic approaches that harness nature's own functions to solve environmental issues and achieve socioeconomic benefits. Such solutions address not just climate change, but also other major societal challenges, such as food and water security, human health, disaster risk and economic development. Activities often involve terrestrial ecosystem rehabilitation and afforestation. Examples include expanding agroecological practices for biodiversity co-benefits, restoring degraded land to increase yield and soil carbon storage, and rehabilitating mangroves for flood buffering services for coastal communities.

From 2020 to 2030, nature-based solutions implemented with safeguards could provide up to 37 per cent of the mitigation needed to limit average global warming to below 2°C. Many cities are increasingly incorporating these solutions into planning, such as Melbourne, Australia with its Urban Forest Strategy. Actions taken by cities include green roofs and city parks to

relieve heat stress, community gardens in abandoned spaces, city lagoons that store water and permeable surfaces to reduce storm water surges (Mccormick, 2020). Seaweed cultivation is gaining traction as a powerful solution given great potential for carbon capture and other ecosystem services. It also provides biomass for complex (nanostructured) materials, pharmaceuticals, extraction of food or feed ingredients, and biofuels (Hasselström et al., 2018).

At the national and global levels, policies to accelerate the energy transition towards renewables and improved efficiency will be crucial for climate mitigation. Renewable energy is growing rapidly, and in 2018, investment hit $272.9 billion, far outstripping investment in fossil fuel energy. Non-renewable energy still accounts for three quarters of all electricity globally, however. Continued fossil fuel subsidies of hundreds of billions of dollars each year are largely to blame for slowing progress (Frankfurt School-UNEP Centre and BNF, 2019).

Effective national and subnational policy actions have included carbon pricing (via carbon taxes and emissions trading schemes), the phasing out of fossil fuel subsidies, levelling the playing field for sustainable energy investments, setting upper limits to carbon emissions in various sectors, and reducing taxes on low- and zero-emissions private vehicles. At the global level, climate finance, and the development, diffusion and transfer of climate-relevant technology, are critical to move forward (IPCC, 2014).

Various aspects of human behaviour, lifestyle and culture strongly influence energy use and carbon emissions. Cutting energy demand is therefore another crucial policy dimension, at all levels of government. Demand-side interventions can provide cost-effective solutions as they are flexible, hedge against supply shocks, avoid lock-ins to carbon-intensive infrastructure and bring about co-benefits. Ways to influence demand include behavioural nudges, awareness campaigns about sustainable diets, reductions in food waste through community composting initiatives, shifts in consumption patterns of material goods, and energy and information measures, such as labelling products for better-informed consumer decisions.

BIODIVERSITY AND ECOSYSTEMS POLICY

If we fail to act on declines in biodiversity and ecosystems, the costs will be extremely high. The damage is largely irreversible, such as through the extinction of species. Some success has been observed where local, national and global governance initiatives have enforced environmental regulations, reduced or eliminated environmentally harmful subsidies, and introduced economic incentives that protect ecosystem services. The global community has not adequately addressed the direct and indirect drivers of environmental deterioration and habitat loss, however. It is likely that the Aichi Biodiversity Targets for 2020 have largely been missed (CBD, 2018a, 2018b).

Illegal and unregulated trade in wildlife not only threatens ecosystems and wildlife populations, but also exposes humans to higher risks of zoonotic diseases. A global response needs to simultaneously limit risks to endangered species, human health and ecosystem stability.

Issues of biodiversity and environmental decline have received relatively low political buy-in. This is due in part to the fact that nature's many contributions to the economy are largely overlooked and uncounted. Valuation techniques and frameworks for making nature's values

visible in economic analysis are improving, especially with the increased use of systems of environmental and economic accounting. Much more work is needed, especially to value the biodiversity elements of ecosystem services.

National governments should invest in mainstreaming natural capital and ecosystem services into their systems of accounts, especially for informing sectoral policy, land-use planning and agricultural policy. Approaches such as payment for ecosystem services, which involves internalizing positive externalities and discouraging land management actions that are destructive or degrading, should be explored by governments at all levels and implemented on a local scale.

LAND USE AND FOOD SYSTEMS

As a global community, we will need to generate major transformation in food production systems and a deeper understanding of how biodiversity sustains the productivity of land and livelihoods. The strong overlap between the main drivers of land degradation and biodiversity loss signals the potential for tackling these issues together. The synergies also provide a firm foundation for progress during the United Nations Decade on Ecosystem Restoration 2021–2030. Specific measures at all levels of government include promoting sustainable agroecological practices and implementing cross-sectoral land management strategies.

Following the principle of land degradation neutrality will be integral to this effort, to ensure key requirements of productivity such as soil fertility, pollination, water supply and resilience against climate change (UNCCD, 2019). This principle is defined as: "A state whereby the amount and quality of land resources, necessary to support ecosystem functions and services and enhance food security, remains stable or increases within specified temporal and spatial scales and ecosystems" (UNCCD, 2015). Transition costs associated with switching to sustainable land management are relatively low, and it has been estimated that crop production alone could deliver up to $1.4 trillion in increased incomes (UNCCD, 2015). A comprehensive study conducted across 42 countries in Africa found that taking action on soil erosion over 105 million hectares would save up to $62.4 billion in net present value over the next 15 years (ELD, 2015).

Securing the health and resilience of oceans can keep people's livelihoods afloat while maintaining habitats that protect biodiversity and regulate climate change. While it is possible to ensure the sustainability of fisheries and conserve marine species and ecosystems at the same time, this demands urgent coordinated interventions on land, in fresh water and in oceans. Ecosystem approaches must underpin fisheries management, and be complemented by capacity-building, enhanced corporate social responsibility, spatial planning, protection and management of key marine biodiversity areas, and reduced run-off of pollution into oceans. To deter and eliminate illegal and unregulated fishing, new legal binding instruments should be developed, and global agreements for responsible fisheries enforced (UNEP, 2019c).

Increases in environmentally beneficial practices in agriculture are encouraging. Small landholdings (less than two hectares) contribute approximately 30 per cent of global crop production and 30 per cent of the global food caloric supply, using around a quarter of agricultural land and usually maintaining rich agrobiodiversity (IPBES, 2019). Best practices are emerging

from developing countries demonstrating the beneficial social and environmental impacts of ecologically friendly agriculture (UNEP, 2020).

A STAND-OUT SOLUTION: THE CIRCULAR ECONOMY

In addressing concerning trends in pollution and waste, the circular economy framework stands out (box 2.7). It is based on the simple notion of using and reusing resources more efficiently across their life cycle. Primary raw material consumption is decoupled from economic growth by closing, extending and narrowing material loops. Transitioning to a circular economy is crucial for stemming waste flows such as plastic pollution and e-waste. It also helps to reduce pressure on scarce raw materials and increase the efficiency of production.

National government policies can facilitate the transition to a circular economy, particularly in early phases by:

- Regulating the phasing out of hazardous substances from products;
- Raising standards for recycling and repairing products;
- Introducing or strengthening "extended producer responsibility" schemes; and
- Introducing requirements for eco-design.

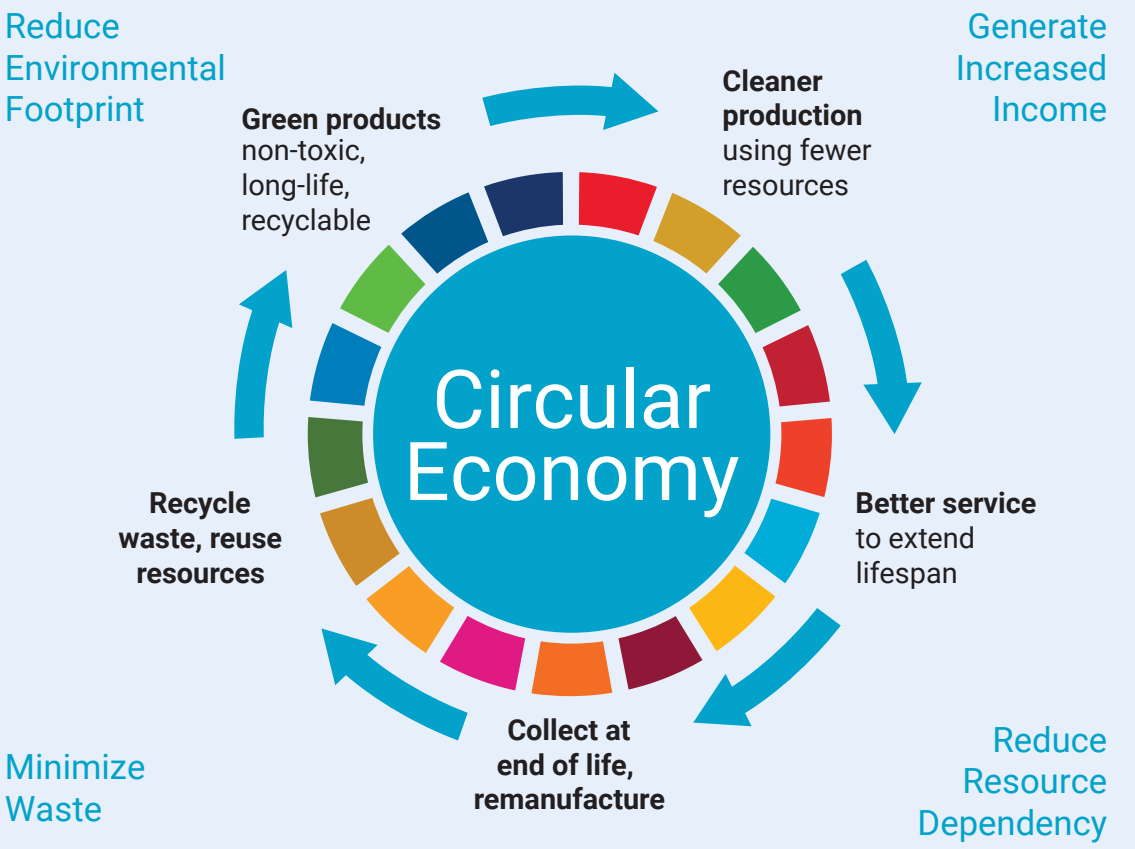
International cooperation among circular economy value chains could hold great potential for standardizing the quality of materials, promoting demand for second-hand goods and secondary raw materials, removing unnecessary regulatory barriers, and avoiding environmentally harmful production. Links between the circular economy and international trade are numerous and can occur at various points along product value chains, for example: trade in materials and waste for recycling and energy recovery, trade in secondary raw materials, trade in second-hand goods, and trade in goods for refurbishment and remanufacturing (OECD, 2018).

With a narrowing window for change, an opportunity to do better

The current economic system has exerted great stress on the natural environment. The unfolding COVID-19 pandemic reveals the snowball effect triggered when just one element in an ecological system is destabilized. At a critical juncture in seeking to overcome this immense shock, governments continue to develop stimulus packages to rebuild the economy and help businesses post-crisis. The decisions made in this process, by governments as well as the private sector and civil society, will determine the future health, well-being and stability of people and the planet (World Economic Forum, 2020a).

The notion that post-COVID-19 economic recovery and stimulus packages should be focused on a green economy and sustainable industries is, unfortunately, not unanimous. The fact that a majority of the stimulus money so far announced by governments is set to prop up fossil fuel industries is a cause for concern. Some nations, however, especially those with well-established intentions for greening their economies, have managed to plan economic stimulus around sustainability. The Republic of Korea, for example, having achieved a strong mandate for a European-style Green New Deal, has become the first nation in East Asia to enact a pledge to reach net zero emissions by 2050.

BOX 2.7 CIRCULAR ECONOMY



Our current system of manufacturing takes raw materials from the environment and turns them into new products, which are then disposed of as waste, back into the environment. This is a linear process in which limited raw materials eventually run out. Waste accumulates, incurring expenses related to disposal or producing pollution. Since manufacturing processes are often inefficient, they lead to further waste of natural resources.

In a circular economy, products are designed for durability, reuse and recyclability. Materials for new products are made from old products. As much as possible, everything is reused, remanufactured, recycled back into a raw material, used as a source of energy and only disposed of as a last resort.

Efficiency gains can come with the transition to a circular economy. By 2025, around $1 trillion could be saved in materials under circular business models. National economies, entrepreneurs and employees will reap benefits through forming new businesses and creating new jobs in resource recovery and remanufacturing (UNIDO, 2017).

Other countries, particularly in Europe, have refocused attention on green recovery strategies, such as Denmark investing in the green renovation of public housing, France incentivizing green investment in the auto-sector and Lithuania co-financing climate change investment projects, among others (IMF, 2020). Some developing countries are re-aligning priorities for growth. Uganda plans to introduced tax exemptions on medical items, and expand labour-intensive public works programmes to build roads and water systems, and carry out environmental projects. China, Germany and the Republic of Korea included green-stimulating measures and clean energy in economic recovery plans (World Bank, 2020) (box 2.8).

Green economy initiatives are useful. We should make continued efforts to break the long-held belief that economic growth and environmental improvement cannot occur simultaneously – in fact, they only occur in tandem in the long-term. We must also do more to limit aimless economic growth that does little to increase broader human well-being, and that can in fact be destructive. Economic development and indicators of progress need to reflect this consideration. Action is urgently needed, with an ever-narrowing window to move towards climate resilience and sustainable development.

BOX 2.8 INTEGRATING NATURE INTO STIMULUS PACKAGES

Governments can design stimulus packages that bank on biodiversity, with benefits for human health and the global economy. McKinsey and Company has developed a basic guide.

Green stimulus programmes should be identified and prioritized:

- **Through careful evaluation of socioeconomic benefits, such as the number of potential jobs per sum invested, GDP or specific demographic group or region.**
- **By defining programmes that can reduce or cut emissions, leading to climate benefits and attainment of the Paris Agreement.**
- **Having realistic goals and time frames for economic stimulus to take effect and emissions to be reduced.**

Bringing nature into stimulus measures would include:

- **Providing tax credits and subsidies to active markets, for example, by targeting companies to improve industrial energy efficiency and create long-term benefits.**
- **Government loans, loan guarantees and grants that fill gaps in private lending and deliver stimulus funding to projects perceived as risky by private lenders.**
- **Direct government ownership of nature and biodiversity-focused initiatives, such as projects on ecosystems services that do not generate immediate revenue but provide many socioeconomic benefits, and help restore nature and biodiversity, such as peatlands or wetlands.**
- **A combined "push and pull" method of regulating and funding to accelerate the benefits from some stimulus programmes. Governments can push (regulation) consumers and companies to choose greener alternatives and/or ban heavy polluting, and pull (funding) consumers and companies to greener alternatives through subsidies or tax credits.**

Clément Falize / unsplash

Demographic trends in an ageing world 3

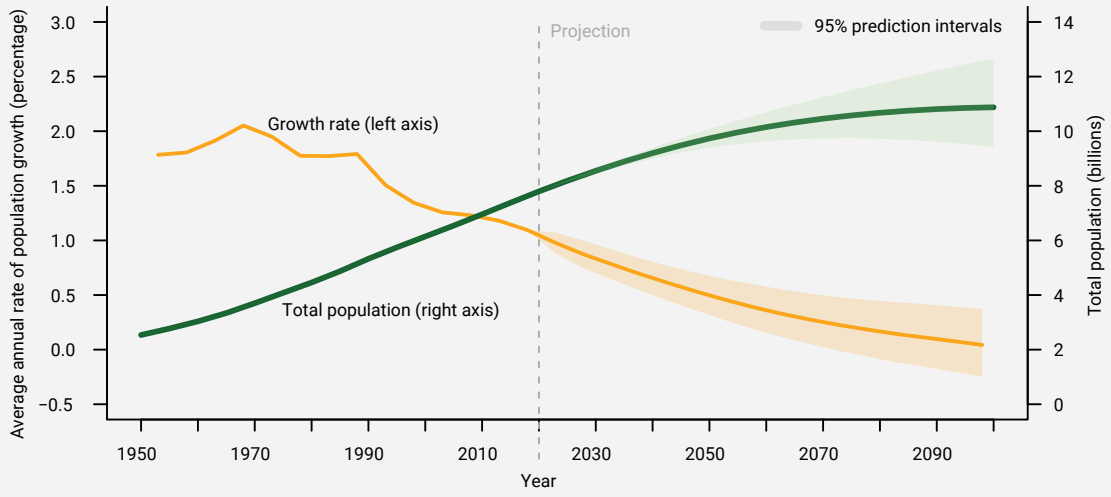
Demographic trends constitute one of the most significant transformations of our time, for individuals, societies and the world at large. The human population has undergone major changes since the founding of the United Nations in the mid-twentieth century. Children born around that time came into a world with 2.5 billion people. In 2020, that number has tripled to nearly 7.8 billion.

The pace of global population growth peaked in the 1960s, with average annual rates of growth above 2 per cent. It has decelerated ever since, to around 1 per cent at present (figure 3.1). United Nations projections indicate that population growth will continue to slow, and possibly stall towards the end of the twenty-first century (United Nations, 2019c).

International discussions about global demographic trends have now shifted from a predominant emphasis on population growth to the implications of slower growth. A particular focus is the progressive shift from predominantly younger populations to older ones, known as population ageing. Figure 3.2 shows changes in age distribution that occur through this demographic transition. In an early stage, marked by falling mortality but still relatively high fertility or fertility that has just begun to decline, populations are youthful, with more than half of people under age 25. When fertility declines become more pronounced, the share of working-age population first expands, and then starts to contract, while the share of older persons continues to grow.

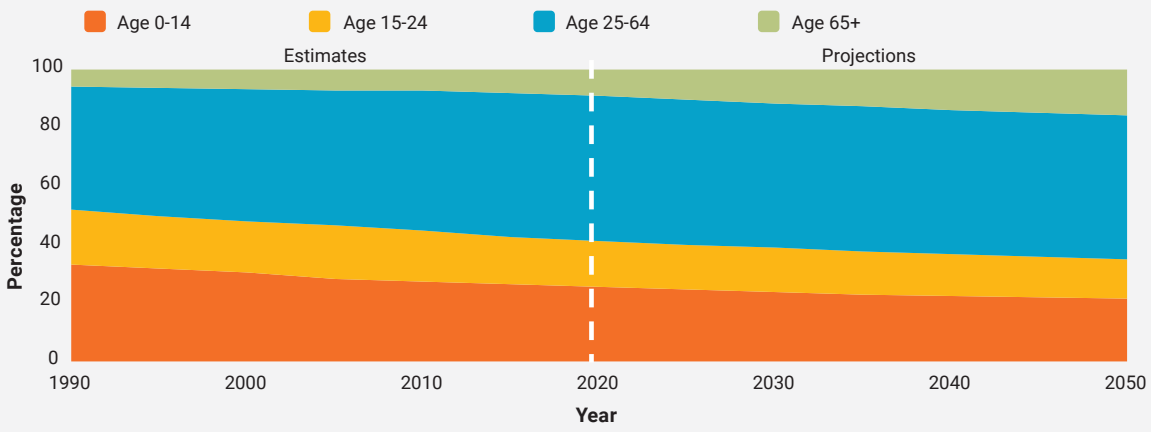
Population ageing is rooted in declining fertility and the extension of life expectancy. In some countries and periods of time, it has also been affected (temporarily) by the net flow of international migrants. There are different ways to define and measure population ageing (United Nations, 2020b). One of the most commonly used indicators is the

FIGURE 3.1 POPULATION GROWTH RATES HAVE PEAKED; POPULATION SIZE TO STABILIZE TOWARDS THIS CENTURY'S END



Source: United Nations, 2019c.

FIGURE 3.2 POPULATION SHARES BY AGE HAVE SHIFTED SINCE 1990

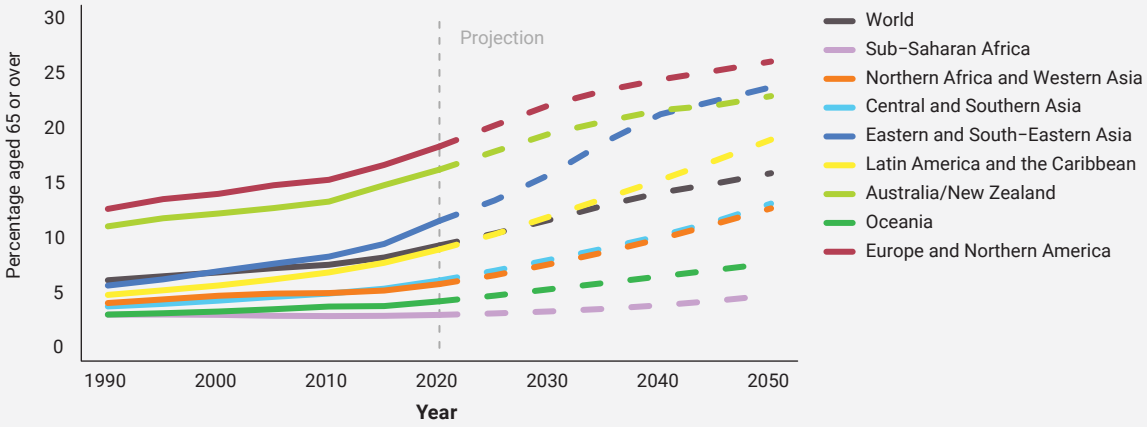


Source: United Nations, 2019c.

proportion of older persons, conventionally considered by the United Nations to be those aged 65 years or over in the total population.[1]

Figure 3.3 shows population ageing for the world and individual regions. Ageing is currently most advanced in the more developed regions of Europe and Northern America, Australia and New Zealand, and Eastern and South-Eastern Asia, as it has been for some time. Ageing has barely taken off in sub-Saharan Africa and Oceania.[2] Latin America and the Caribbean, Central and South Asia, and Northern Africa and Western Asia started to

FIGURE 3.3 PERCENTAGE OF POPULATION AGED 65 YEARS OR OVER, GLOBALLY AND BY REGION, 1990–2050



Source: United Nations, 2019c.

Note: Oceania excluding Australia and New Zealand.

1 Other measures include the old-age or total dependency ratio, the median age of the population, and the prospective and economic old-age dependency ratios. See United Nations, 2020b.

2 Excludes Australia and New Zealand.

age decades ago, and are currently in a mid-range position among major world regions.

The figure also suggests that population ageing is a global phenomenon. It is currently advanced in the more developed countries, while youthful populations are still more common in low- and lower-middle income and low-income countries, many located in Africa, and parts of Asia and the Pacific. Yet ageing is progressing in a number of developing countries at a more rapid pace than in the past, which poses particular development challenges (United Nations, 2017a, 2019b). The diversity of age structures is reflected in the considerable and increasing spread of the median age across countries up to 2030, with a decline expected thereafter (United Nations, 2017b). The different stages and speeds of ageing observed around the world are illustrated in box 3.1.

Demographic trends, including population growth and progressive ageing have

BOX 3.1 DEMOGRAPHIC TRANSITION AT DIFFERENT STAGES AND SPEEDS

One example of rapid ageing in the twentieth century is the Republic of Korea, where the total fertility rate was over 6 children per woman in the late 1950s. Fertility fell below the replacement rate of 2.1 children per women around the mid-1980s, and continued declining to the present level of 1.1 children per woman, one of the lowest total fertility rates in the world.

During the same period, the country's life expectancy at birth (for both sexes combined) increased steadily from 53 years in the late 1950s to 83 years at present. These trends underlie a sharp increase in the old-age dependency ratio (the population aged 65 years or over per 100 persons aged 20 to 64 years), which more than tripled from 7.6 per 100 in 1960 to 23.6 per 100 in 2020.

Other countries in Asia and the Pacific and Latin America and the Caribbean have also experienced significant population ageing, although rarely with the speed and intensity of the Korean case. All countries, but especially ageing societies, must address a range of issues, such as facilitating the social and economic participation of older persons, promoting healthy ageing, ensuring income security in old age, combating age-related discrimination and developing viable long-term care.

In other countries, fertility is still relatively high and has fallen slowly over the last several decades. This applies to many countries in sub-Saharan Africa and Oceania (excluding Australia and New Zealand); some in Northern Africa, Western Asia, Central Asia and Southern Asia; and a few in Latin America and the Caribbean. The most pressing development issues they face include providing quality education and productive employment for rapidly growing working-age populations.

For example, Nigeria, the most populous country of sub-Saharan Africa, saw its fertility rate decline from 6.4 children per woman in the 1960s to 5.5 at present. The working-age population has grown vigorously throughout this period, with tens of millions of young Nigerians requiring employment, all while the old-age dependency ratio remains at essentially the same level as in 1960 – 6.3 people aged 65 or over per 100 people aged 20 to 64.

considerable momentum. They cannot be switched off or reversed from one day to the next. Policy responses need to be decisive, proactive and persistent to make an effective contribution to sustainable development.

Put differently, even though demographic transitions to low fertility and population ageing during the past half century have often taken place at faster rates than in earlier times, ageing typically unfolds over long periods of time that can span half a century or more. This is a time horizon over which major structural, even systemic economic transformations or irreversible climate change can take place. If societies and economies postpone critical measures to benefit from and adapt to ageing, present and future generations may pay high costs. For example, countries that delay the provision of universal access to sexual and reproductive health and reproductive rights are bound to bear additional health-care costs and forfeit the economic benefits of the demographic dividend. Another example is delayed reform of social security systems, which imperils their long-term sustainability and unfairly passes on extra financial burdens to future generations.

The built-in demographic inertia of population momentum in the early stages of the demographic transition is spurring rapid increases in the absolute number of older persons, with the fastest rises in sub-Saharan Africa, and in Northern Africa and Western Asia (United Nations, 2019b, table 1). The sex ratio varies with the stage of transition from youthful to older populations, but a consistent feature in most countries and regions is that women outnumber men in the older age groups, due mainly to longer female life expectancy.

Changing age structures are also closely related to evolving household structures and the living arrangements of older persons, with specific policy implications. While many older persons live with their adult children or in extended households, a significant proportion of them live alone. This applies to 16 per cent of women aged 60 and over, and 8 percent of men (UN Women, 2019). This sharp male/female difference is partly explained by the fact that women live on average several more years than men, as well as by women's propensity to marry men who are older than they are. A growing proportion of older people in both developed and developing countries are living independently (alone or with a spouse only), with older women overrepresented in this category as well.

Many older persons are in good health and remain productive members of the labour force. Even after they retire, they contribute to their communities and the care of grandchildren, especially when both parents work outside the home. But the progressive increase in survival to ever older ages also raises questions about who will care for the older people of tomorrow as their ability to carry out daily activities declines. This problem is exacerbated in contexts of increased migration (internal and international) where adult children live too far away from their elderly parents to provide regular daily assistance. Globally, about 8 per cent of all households are lone-parent households (ibid.). A large majority of these, more than 84 per cent, are headed by women.

Trends in population age structure vary between urban and rural areas. The rural population continues to increase in low-income countries, but is starting to age as well, a trend intensified by the migration of young people to urban areas, while older people mostly remain in rural areas. In Africa and other regions, young people are increasingly pursuing opportunities outside of agriculture and rural areas due to unfavourable working conditions and remuneration, and insecurity caused by environmental risks and long-term climate change.

Drivers of changing age structures

An early and universal trigger of demographic transitions is declining mortality, which in many cases historically has preceded fertility declines by a few or more decades. In contemporary societies, improved pre- and postnatal health care, stemming from expanded sexual and reproductive health-care services, including family planning, have reduced maternal and child mortality and morbidity. In the more advanced stages of the demographic transition, reductions in mortality have accelerated growth in the number and population share of older persons, at faster rates than those among young people or middle-aged adults.

Premature mortality, including during mortality crises, can significantly reshape the population age structure. Two prominent examples in recent decades have been the increased mortality that followed the break-up of the Soviet Union in some successor states, and the sharp declines in life expectancy at birth in sub-Saharan Africa caused by HIV/AIDS. These and other cases of premature mortality disproportionally affect adults of prime productive potential, and lead to increased dependency ratios and numbers of orphaned children. An additional consequence is that much of the burden of caring for orphaned children falls on grandparents, especially grandmothers who step in when one or both parents have died. For an example of a mortality crisis affecting older people, see Box 3.2 on COVID-19.

BOX 3.2 THE DEATH TOLL OF COVID-19 IS GREATER AMONG OLDER PERSONS

A different example of crisis mortality is the ongoing COVID-19 pandemic. By the end of June 2020, more than 10 million cases of the disease had been reported, and more than 500,000 people worldwide had died from it, with major impacts on employment and economic activity across the globe. The ultimate impact of the epidemic on mortality indicators such as the crude death rate or life expectancy is likely to be significant to large, especially in countries with older populations or weaker health systems, and fewer resources to contain the disease and treat those infected.

Available data suggest that the disease has spread more easily among adults than children, and that it is particularly lethal for older persons. But so far, overall age patterns in COVID-19 mortality in most countries does not appear to be very different from that of all-cause mortality, typically concentrated in the older ages. This means that countries with older population age distributions would show more per capita COVID-19 deaths than countries with younger populations even if they had the same age-specific mortality rates.

For example, the United States of America, with a moderately aged population, would be expected to have fewer deaths per capita than a more aged population like Italy's, and more deaths per capita than a more youthful population like India's (Goldstein and Lee, 2020). These differences should be taken into account when comparing aggregate death rates or other indicators of morbidity and mortality across countries. Without standardizing for the different age structures, the aggregate measures do not provide an unambiguous indication of the severity of the epidemic or the relative success of the mitigation measures in different countries.

Over the long-term, sustained reductions in fertility are by far the most important determinant (or "driver") of population ageing (Lee and Zhou, 2017; United Nations, 2017c). In the next two to three decades, in countries now in advanced stages of the demographic transition, population ageing will also be driven by current age structures and, to a lesser degree, by continued mortality reductions, as future gains in survival become more concentrated in older ages.

In some countries, especially those that are net receivers of large numbers of international migrants, international migration has contributed to slowing population ageing, because migrants tend to be younger adults. Migration, however, generally does not compensate for, much less reverse, the long-term trend towards ageing in realistic forecasting scenarios.

Among the socioeconomic drivers of ageing, increased education stands out, for its consistency and explanatory power. Education is strongly associated with both lower fertility and increased longevity (National Research Council, 1999; Lutz et al., 2017).

Demographic challenges and dividends

Population ageing reflects great success in reducing premature mortality and extending human life expectancy. It also results from other positive socioeconomic developments, including broad progress in education, the exercise of reproductive rights and the empowerment of women, all factors that underlie most modern fertility declines. Ageing also raises concerns, however, about potential consequences for the dynamism of economies and the sustainability of systems that support a burgeoning share of older persons. This is especially true for countries already at more advanced stages of demographic transition, and for those countries that, while not yet in advanced stages, are ageing rapidly. Some are getting old before getting rich.

The challenges of population ageing vary according to the stage of demographic transition. In an early stage, where mortality falls but fertility remains constant at relatively high levels, or has just started to decline, populations are youthful. A major concern is to generate productive employment for rapidly growing cohorts of young people entering the labour market, while maintaining or expanding investments in education and health, especially for children and youth.

During subsequent stages of the demographic transition, when fertility declines become more pronounced, a major challenge arises from slowing growth in and eventually a decline in the absolute size of the working-age population. This produces rising old-age dependency ratios[3] that require the adaptation of labour markets, pensions, health care and social systems to ensure adequate support and sustainability. Without such reforms, there may be increasing fiscal pressure on pension and health-care systems, as well as stresses on families in societies where public support is limited, and adult children are expected to care for older parents and grandparents.

Between the early and advanced stages of demographic transition, there is an intermediate period when an economically favourable change in the population age distribution takes place. Fertility and child dependency ratios have fallen, yet the proportion of older persons is still relatively small.

3 Defined as the ratio of the population aged 65 years and over divided by the working-age population, aged 15 to 64.

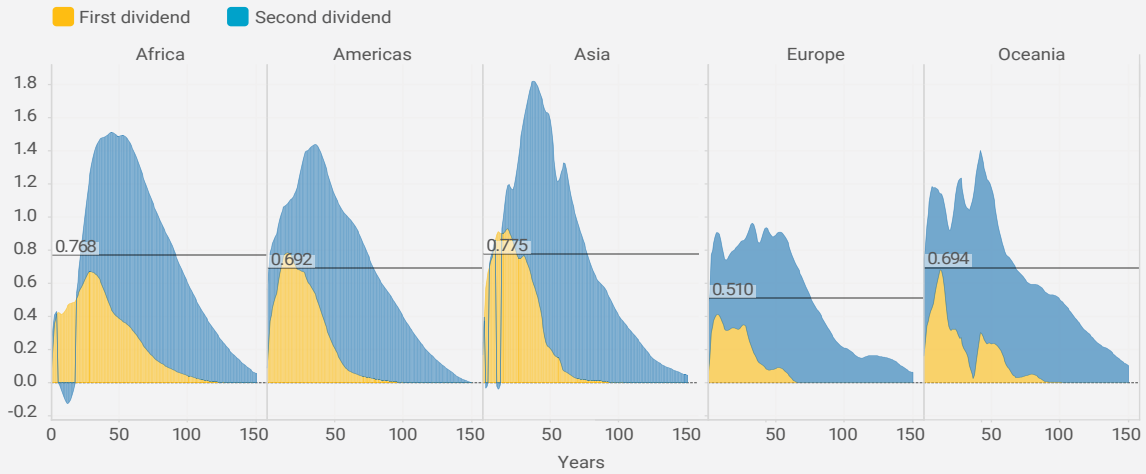
This intermediate period is often referred to as the "window of opportunity" for a first *demographic dividend*, namely, the accelerated economic growth associated with the transformation in the age composition (United Nations, 2017a; Lee and Mason, 2006; Bloom et al., 2003). The challenge for countries in this demographic phase is to make the best of a time-bound opportunity. As the share of the working-age population in the population rises, and overall dependency ratios fall, more resources are available for consumption and to invest in education, health and other forms of human capital. This supports increased well-being and fosters medium-term economic growth.

A second demographic dividend arises as the population ages due to continued declines in fertility and mortality. Higher productivity per worker stems from both increased human capital (as noted above) and physical capital per worker, which comes about because ageing populations require people to hold capital to help fund consumption at older ages. Therefore, population ageing tends to raise the ratio of capital to labour, which makes labour more productive (Mason et al., 2017). There may be exceptions or variations around this long-term trend, for example in populations with wide swings in their age structure, where the risk of concentrated liquidation of assets later in the life cycle could negatively affect asset prices during specific periods of time.

The magnitude and timeline of the first demographic dividend (spurred by the growth of the working-age population) and of the second demographic dividend (based on the growth in capital from lifetime savings) are illustrated in figure 3.4, estimated on the basis of National Transfer Accounts concepts, measures and data, and United Nations population estimates and projections. This figure, and the information given in table 3.1, show

FIGURE 3.4 FIRST, SECOND AND COMBINED DIVIDENDS BY YEARS SINCE THE ONSET OF THE FIRST DEMOGRAPHIC DIVIDEND

Percentage points of per capita income



Source: Mason et al., 2017, p. 35.

Note: Based on simple average values for 164 countries for the first dividend and 112 countries for the second dividend. Average values refer to the average for the combined support ratio.

TABLE 3.1 SUMMARY OF FIRST AND SECOND DIVIDEND ESTIMATES

By region, average annual percentage growth of per capita income

Region	Start of first dividend	Peak dividend (dividend year)			Average dividend, 100 years		
		FIRST	SECOND	BOTH	FIRST	SECOND	BOTH
Africa	1993	0.82 (25)	1.33 (51)	1.80 (48)	0.32	0.67	1.00
Americas	1975	0.84 (19)	1.15 (43)	1.51 (33)	0.15	0.67	0.82
Asia	1973	1.38 (20)	1.88 (42)	2.35 (34)	0.18	0.72	0.90
Europe	1962	0.68 (22)	1.24 (37)	1.35 (28)	-0.08	0.56	0.48
Oceania	1974	0.66 (14)	1.24 (38)	1.50 (28)	0.09	0.71	0.80

Source: Mason et al., 2017.

Note: Based on 112 countries for which both first and second dividend estimates are available.

that the start of the demographic dividend was earliest in Europe, in the early 1960s. Asia, the Americas and Oceania followed in the early to mid-1970s, while the dividend began most recently in Africa, in the 1990s.

At its peak, the demographic dividend can contribute between 1 and 1.7 percentage points to annual GDP per capita growth. Although the first dividend period is limited, up to 50 years in most cases, the second dividend can be maintained for much longer.

According to these estimates, the first demographic dividend has largely expired in Europe as a whole, although the second divided is still expected to be in place through the end of the present century. The excess demand for labour in already aged societies has become a major pull for international migration, which can also spur nativist reactions, discrimination and even abuse against migrants in some cases. This poses a set of issues that progressively ageing countries in Europe and elsewhere will likely continue to face in years and decades to come.

The combined (first and second) dividend will likely last longer especially in Africa – even beyond the twenty-first century – provided countries are able to generate sufficient employment and investments in human and physical capital to realize the dividend's full macroeconomic benefits. The share of the working-age population in Africa is projected to expand well past the middle of the century. From 1990 to 2020, however, the increase in the working-age population was only mildly correlated with GDP per capita growth, underscoring that demographic opportunity must be proactively sought and supported to become a real macroeconomic boon.

Some of the challenges associated with population ageing relate to the care economy. These include demands for the care of children and older persons that often fall on the "middle" (sometimes also called the "sandwich") generation, typically in their prime productive years. As time use surveys show quite consistently, these responsibilities are assumed predominantly by women. In many developed countries, a large proportion of

care workers are international migrants who fill significant gaps in labour markets.

A recent ILO report (2018) shows that children aged 0 to 14 years represented 90 per cent of total dependents in 2015, underlining the scale of the need for affordable childcare services. At the same time, the growing share of older persons and evolving living arrangements lead towards increased investment in long-term care systems. The latter is already a major policy issue in developed regions such as the European Union, but is also an emerging challenge in developing countries, including some in sub-Saharan Africa, and in Asia and the Pacific. Expanding care services represents an investment in the capabilities of children and other dependents, allows women to pursue paid employment and contributes to job creation (Staab, 2016; De Henau et al., 2019).

Demographic trends shape multiple SDGs

Demographic trends, including changing age structures, have significant impacts on many areas of sustainable development, including SDG 1, because they can help to reduce poverty and affect the fiscal balance of social protection systems. Demographic trends also relate to SDG 2, on ending hunger, since slower population growth reduces aggregate demographic pressure in the fight against hunger, and efforts to improve nutrition and food security. Population shifts can support progress on SDG 3, on improved child and maternal health and healthy lives for all, and SDG 4, on education, given the well-documented association between reduced fertility and increased investment in schooling per child (United Nations, 2017a).[4]

Under SDG 5, on gender equality, improvements such as universal access to sexual and reproductive health-care services and the incorporation of women in the formal labour market propel declines in fertility associated with demographic transition and ageing. Conversely, the cumulative disadvantages experienced by women that result in low wealth accumulation, reduced participation in social security systems and high risk of poverty in old age remain important concerns (United Nations, 2015).

The demographic transition can facilitate the achievement of SDG 8, on sustainable economic growth, to the extent that the demographic dividend contributes to sustained and inclusive economic growth, productive employment and decent work are available, and investments in human capital (education and health) increase. Changing age structures can also potentially contribute to SDG 10, on reducing inequalities within and among countries, if reduced fertility cuts across socioeconomic groups, and services and economic opportunities are broadly accessible to all people over the life course.

Interactions between demographic and other megatrends

The transition from younger to older populations can be influenced by, and in turn influence, the four other megatrends discussed in this report: climate change, technological innovation, inequality and urbanization. In general, the other megatrends influence demographic trends through their effects on the demographic drivers of population change: mortality, fertility and migration.

4 For further discussion of demographic change on development, see Herrmann, ed., 2015.

Climate change affects demographic change through two main channels: migration and mortality. Both sudden-onset climate-related events like floods and hurricanes, and longer-term processes like rising sea-levels and shifts in precipitation patterns can spur migration flows within and among countries. Morbidity and mortality risks are also affected by natural disasters, climate-induced changes in ecosystems leading to a rise in vector-borne epidemics, and excess deaths from heat waves. In particular, risks of malnutrition and food insecurity are affected by droughts, floods and other climatic events.

Technological change has been fundamental to lowering mortality and fertility rates that lead to population ageing. Medical technologies – especially child immunizations – have led to dramatic declines in mortality. Survival to age 60 has shifted from a "flip of the coin" – a 50-50 probability in even the wealthiest societies of the nineteenth century, to a chance near 90 per cent in developed countries today. One of the main wild cards in forecasting the future course of population ageing is the possibility of further life-extending technological innovations. Advances of this type are also redefining what it means to be "old", as healthy life spans are extended, and the physiological and cognitive decline associated with ageing is reduced or delayed (Skirbekk et al., 2018; Skirbekk, 2016). Longer healthy lives, in turn, make it possible for people to extend their working lives, with potentially significant economic implications for labour force productivity, macroeconomic growth, and the reorganization of education, work and leisure over individual life cycles.

Although fertility declines unfolded in Europe before the advent of modern contraceptive technologies, sustaining low fertility of two or fewer children per woman requires use of modern contraceptive methods. The availability of a variety of methods, including for men, gives women and couples a wider range of choices around their fertility (Sitruk-Ware et al., 2012). An important fertility-enhancement technology has been in-vitro fertilization (IVF), which has allowed infertile women and couples to have children, in some cases extending the reproductive period, although to date IVF has had a negligible impact on observed fertility at the aggregate level.

Technological change also influences demography through facilitating migration. Within countries, increased agricultural productivity facilitated labour migration to cities as part of the industrial revolution. A notable modern-day example is the rapid industrialization of China, which was accompanied and enabled by massive migration from rural areas to cities, as well as significant "in-situ urbanization", the transformation of previously rural settlements into urban-industrial and service-intensive localities (Zhu, 2017).

A similar trend has been observed in international migration flows. In addition to low-skilled workers, large numbers of highly skilled workers have moved across national borders, especially in information technology (ILO, 2020).[5] In both cases, migration has filled labour gaps in destination countries and produced other positive economic effects. Immigration to Europe and the United States, for example, has partially attenuated three decades of unemployment and wage polarization due to increasing automation (Basso, Peri and Rahman, 2018). Immigration has expanded aggregate demand and allowed natives to move to better-paying occupations. An implication is that policies to reduce low-skilled migration with the aim of

5 See also Mosbah et al., 2019; Gelb and Krishnan, 2018.

favouring native middle-class labour market opportunities may in fact achieve the opposite.

Technologies that allow people to work remotely, especially in the post-COVID-19 world, could dampen migration, reducing the need for daily commutes and even some long-term, long-distance moves. Despite the notorious difficulties and uncertainties surrounding the projection of migration (IOM, 2020), technological innovation leading to the displacement of low-skilled workers and increased international demand for skilled workers is a potent combination likely to sustain continued international flows in the future.

Modern demographic transitions have become possible by extending access to health care, education and other services and opportunities to ever broader segments of the population. Conversely, protracted demographic **inequalities** play key roles in the intergenerational reproduction of poverty, as has been well documented in Latin America and the Caribbean (Rodriguez-Vignoli, 2007; Pantelides and Binstock, 2007), and observed in other parts of the world. Sociodemographic inequalities are reproduced as the poor and other disadvantaged population groups have more limited access to sexual and reproductive health-care services. These groups, left behind both economically and demographically, face greater risks of unintended pregnancy, and have higher rates of fertility and mortality.

One example of the impact of inequality, and even more specifically of economic insecurity on mortality in the more developed countries, has been the decline in life expectancy in the United States in recent years. This has been driven by increases in mortality among adults aged 25 to 64 years, in particular deaths due to suicide, drug overdose, alcohol and obesity (Case and Deaton, 2017). In aged, low-mortality populations, health status and survival at older ages become more important factors of further progress in life expectancy, which depend in turn on the cumulative effect of socioeconomic inequalities over people's life cycles.

Gender inequality also affects fertility patterns. At all stages of the fertility transition, greater gender equality and empowerment of women is associated with better realization of fertility intentions, whatever those may be. During the initial stages of fertility decline, improvements in gender equality tend to be associated with lower fertility. But at the later stages seen in many high-income countries today, gender equality, including a more gender-balanced sharing of household work, is often positively associated with fertility. For example, the Gender Equality Index has been found to be closely associated with the average number of children per woman in European countries (Hippe and Perrin, 2018; Lomazzi et al., 2019). Examples at the other end of the spectrum, where lower levels of gender equality are associated with low fertility, include Japan and the Republic of Korea. Gender inequalities grounded in traditional role expectations of mothers and fathers regarding childrearing, coupled with limited childcare facilities, contribute to some of the lowest fertility rates in the world.

Urbanization influences the pace of demographic transition through mortality and fertility, both of which tend to be lower in urban than rural areas. Lower urban mortality results from higher incomes and greater access to health-care services as well as efficiencies in health-care delivery that are possible in cities. Lower urban fertility is mainly a result of higher educational levels, higher costs of childbearing and easier access to family planning services.

Effects of changing age structures on other megatrends

Climate change: Most of the world's *carbon emissions* come from developed nations, where population growth has slowed, and populations are generally more aged. Future economic growth is likely to raise carbon emissions in the developing world, however, as the rise of the middle class increases aggregate demand for goods and services. Emissions will rise even with improvements in energy efficiency. For this reason, population growth could be a significant contributor to future carbon emissions, although it is important to recognize the uncertainty of future population growth and its impact on climate change. The 95 per cent confidence interval for world population estimated by the United Nations for 2100 is 9.4 billion to 12.6 billion people.[6] The human impact on climate and ecosystems would be very different in a world with several billion more people than the current 7.8 billion.

Given the complex relationship between population and the environment, which is mediated by technological and economic factors, precise estimates of impacts are difficult to obtain. Studies based on a model of nine world regions estimated different trajectories for carbon emissions resulting from population trajectories based on three fertility variants (low, medium and high) taken from United Nations projections. These yield very large differences in emissions by 2050 and 2100 (Bongaarts and O'Neill, 2018; O'Neill et al., 2012). As noted in a 2014 Intergovernmental Panel on Climate Change report (Blanco et al., 2014), improvements in energy intensity have not kept up with population growth and rising per capita GDP in past decades, especially in Asia. These last two factors, particularly rising production, have been the most significant drivers of increased emissions.

Beyond population size, age structure can also affect emissions because consumption and energy-use patterns vary by age (Fürnkranz-Prskawetz, 2008). For example, in the United States, after controlling for income effects, consumption of energy-intensive goods rises with age, peaking in the early 60s and declining gradually thereafter (Zagheni, 2011). Consequently, the expected change in population age distribution during the next four decades is likely to have a small, but noticeable, positive impact on carbon dioxide emissions. In other countries, total consumption levels and energy consumption in particular have moderately declined with age, suggesting a slight dampening effect of population ageing on emissions. In a broader context, however, all of these are second-order effects compared to the impact of population size and that of per capita consumption.

Technological change: A traditional view held that population ageing is likely to reduce technological innovation and adoption. This perspective was well summarized in the 1970s by the demographer Alfred Sauvy and others, who feared that an aged society would be "a society of old people, living in old houses, ruminating about old ideas". This vision relied heavily on the well-known decline in cognitive and physiological functioning associated with ageing. Overlaying physiological decline is the more rapid depreciation of skills in the era of fast-moving technological progress, which reinforces the decline in productivity associated with ageing (Bartel and Sicherman, 1993; Lovasz and Rigó, 2013).

6 The difference between the high and low variant projections is much larger: a high world population of 15.6 billion in 2100 versus a low of 7.2 billion; the latter is lower than today's world population. These scenarios, however, are extreme, and very unlikely to materialize.

A more positive perspective on the prospects of an ageing workforce in an environment of rapid technological innovation underscores the value and necessity of lifelong learning (Park, 2019). This view puts greater emphasis on population ageing as a potential, if not actual, stimulus for technological innovation.[7] Two key mechanisms are at work. The first is the lower rate of labour force growth in aged societies, which serves as an economic incentive for labour-saving technological innovations (e.g., robotics and artificial intelligence). The second is that the increased health-care demands of ageing populations stimulate technological innovation, ranging from robotics aimed at providing elder care (e.g., "care-bots") to longevity-promoting pharmaceuticals, a new class of medications targeting ageing itself (e.g., antioxidants, calorie restriction mimetics, autophagy inductors) rather than particular pathologies. At a macroeconomic scale, greater demand for capital associated with ageing supports the second demographic dividend and may further incentivize technological innovations in seeking new opportunities for productive investments.

Inequalities: A different set of factors suggests that population ageing may contribute to worsening economic inequality within countries. A recent study of the United States found that population ageing would likely increase the share of wealth concentrated among the top decile by about 7 percentage points – up from its current level of 50 per cent (Goldstein and Lee, 2014). This effect is mainly due to a forecasted increase in capital intensity due to slower population growth (Piketty, 2014). While the health and income security of older persons have improved in past decades in countries in the Organisation for Economic Co-operation and Development (OECD), a recent report highlighted the risks of increased inequality for future retirees due to more unstable labour market conditions and growing inequalities in both individual earnings and household incomes (OECD, 2019).

Another type of inequality among population groups, especially in developing countries, relates to economic sectors and places of residence. This leads to challenges such as in retaining young workers in farming and agriculture amid rapid technological change and limited opportunities for decent employment in rural areas. Policies and programmes to support rural youth in the agricultural sector and the rural economy more broadly should build on and strengthen entrepreneurship for young and older workers alike, while increasing their access to financial services and relevant markets.[8]

Finally, intergenerational transfer systems – taxing the working-age population to support older persons – are a common feature of most economies in the world. These systems come under increasing fiscal pressure from population ageing as the share of older persons relative to working-age persons increases. To strike a fiscal balance while addressing new demographic realities, governments must implement some combination of decreasing benefits or increasing taxes, on either labour income or assets. But how that is done, and who bears the burden of tax increases and benefit reductions, has important implications for economic inequality.

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7 See, among others, Lloyd, 2018; Gratton and Scott, 2016.

8 FAO's Integrated Country Approach promotes decent rural employment. See www.fao.org/rural-employment/work-areas/youth-employment/ica-programme/en/.

Recommendations and policy responses

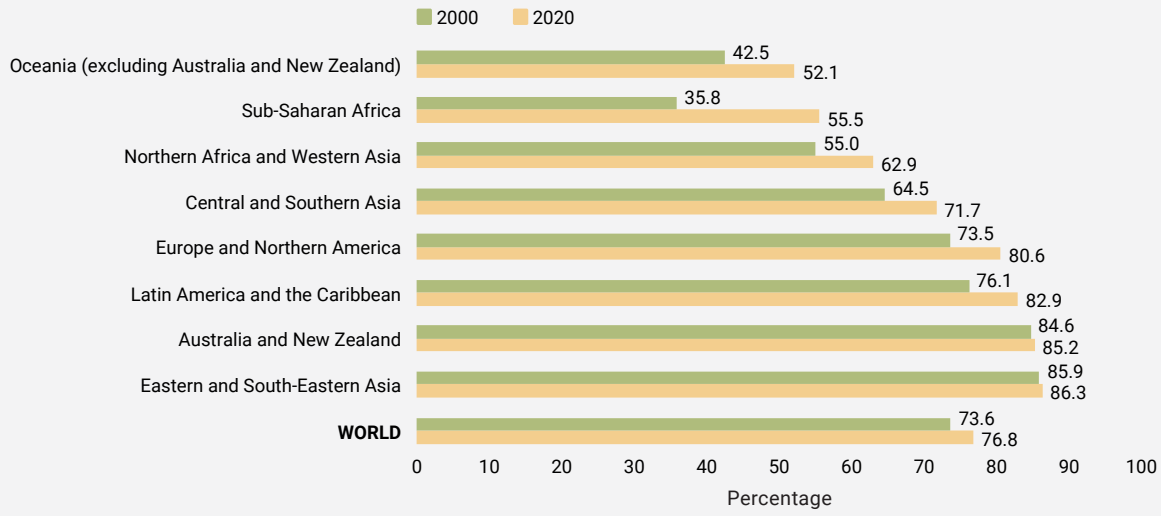
This final section summarizes some of the policy measures and approaches that can assist in addressing the different development issues discussed in this chapter.

Expand access to sexual and reproductive health-care services. The increased availability of modern contraception allows for greater individual choice and responsible decisions around childbearing. Globally, the proportion of women of reproductive age (15 to 49 years) who have their need for family planning satisfied with modern contraceptive methods (SDG indicator 3.7.1) has increased slightly (figure 3.5), from 74 per cent in 2000 to 77 per cent in 2020. The proportion has risen in all regions, with the fastest progress in those where levels were lowest at the beginning of the period: from 36 per cent in 2000 to 56 per cent in 2020 for sub-Saharan Africa, and from 43 to 52 per cent in the same period for Oceania (excluding Australia and New Zealand).

At the current pace of change, these two regions will fall short of ensuring universal access to sexual and reproductive health-care services by 2030, as called for in SDG target 3.7. Furthermore, a recent analysis that takes into account the possible impact of COVID-19 on access to contraception concludes that the proportion of women of reproductive age (15 to 49 years) who would have their need for family planning satisfied with modern contraceptive methods could fall to 71 per cent in 2020, resulting in around 60 million fewer users of modern contraception worldwide than anticipated (Dasgupta, Kantorová and Ueffing, 2020).

The continued expansion of family planning programmes offering a wide range of safe and effective methods, and providing accessible, complete and accurate information about them, should be prioritized. Natural methods

FIGURE 3.5 PERCENTAGE OF WOMEN OF REPRODUCTIVE AGE (15 TO 49 YEARS) WHO HAVE THEIR NEED FOR FAMILY PLANNING SATISFIED WITH MODERN METHODS, 2000 AND 2020



Source: United Nations, 2020a.

such as post-partum abstinence and breast-feeding commonly used, for example, by poor women in sub-Saharan Africa can help these groups achieve their reproductive goals (Finlay, Mejia and Akachi, 2018). But the mix of options would not be complete without effective modern methods such as pills, IUDs, injectables and condoms. The guiding principle is and should remain to provide women and couples with information and means to decide freely and responsibly about the number and spacing of their children.

Growing use of contraceptive methods has contributed to improved individual health outcomes by reducing unintended and high-risk pregnancies, and maternal and infant mortality, especially among adolescents (Finlay, Norton and Mejia, 2017). It has also helped to expand schooling and economic opportunities for girls and women.

Reductions in fertility have further enhanced economic growth as a result of reduced child dependency and an increased number of women participating in paid labour (Canning and Schultz, 2012). Conversely, in countries or regions with continued high fertility and rapid population growth, the full implementation of the 2030 Agenda for Sustainable Development remains constrained as they struggle to provide enough health care, education and employment for rapidly growing numbers of children and young people.

Three key economic benefits stem from expanding access to sexual and reproductive health-care services. The first is that fertility decline increases the share of the working-age population; a "demographic dividend" ensues. Second, in ageing societies, children represent a smaller share of the total population. This frees up resources once invested in the health and education of children for use in lifelong learning for all, including for older persons. Third, meeting demand for family planning – helping couples achieve the smaller families they desire – can indirectly contribute to mitigating climate change.

Investing in education and health for all, including lifelong learning helps to improve productivity and maintain economic growth, even as the share of the working-age population shrinks. These investments in children and youth need to be maintained or increased, especially in countries at the initial or intermediate stages of the demographic transition, before government budgets are hard pressed to cover expenditures for health care and social security systems linked to growing numbers of older persons. Expanded human capital for all generations, young and old, helps sustain and strengthen present and future economic prosperity and well-being. Lifelong learning will be increasingly important to keep up with technological change and ensure the flexibility of skills across the life cycle. Specific training for older persons in using new technologies will endow them with greater opportunities to stay active, including in the labour market.

Promoting gender equality in employment and adopting family-friendly policies improves labour force participation and sustains higher levels of economic activity and well-being. Creating conditions for women's greater participation in the labour market, in productive and decent work, is an effective way to address shrinking working-age populations. These policies, well justified in their own right, could also lead to an additional "gender" dividend, even if only a partial closing of the gender gap in labour income were achieved by 2050, in countries as varied as India, the United States,

and Uruguay and other Latin American countries (Belohlav, 2016; Miller et all, 2016).

In many countries, cultural, legal and structural barriers prevent women from entering and continuing in the formal workforce at the same level as men. Policies to enhance female labour force participation include those to reduce discrimination and sociocultural barriers; recognize women's skills in the modern labour market; and implement family-friendly programmes such as affordable childcare, paternal and maternal leave, and part-time and flexible employment opportunities for both men and women. The extension of paid caregiving improves fairness and efficiency in the allocation and compensation of women's work within and outside the household.

Monitoring and planning for more egalitarian aged societies. A review of lessons learned from the Millennium Development Goals noted that without knowing how many people are living, how their numbers will change, where they are living, how geographic distribution is changing, how old they are and how the age structures will change in the future, it is impossible to understand, plan for or meet human needs. "We need to count people to make people count" (Hermann, 2015). The imperative of integrating population into development planning and decision-making was recognized in the Programme of Action of the International Conference on Population and Development in 1994, and has been reaffirmed in different ways since, including in the Madrid International Plan of Action on Ageing, and in resolutions of the United Nations Commission on Population and Development and the Commission for Social Development. Taking into account changing age structures, and implications of social and economic policies for age-related issues in the long run, is essential to ensure both intergenerational equity and solidarity (United Nations, 2017b).

While population ageing is among the most important forces shaping social and economic development in the coming decades, it is not always explicitly included in policy discussions. Because its influence is difficult to discern in the short run, a myopic policy focus inevitably results in delays in addressing mounting challenges. This problem is common to all gradual but persistent, cumulative concerns such as the extension of non-communicable diseases, climate change and environmental degradation.

Medium- and long-run forecasts, therefore, are important tools in facing and addressing these issues. Long-run economic and fiscal forecasts that integrate demographic trends allow countries to assess and address the cost, sustainability, and – critically important in an era of rising inequality – equity of policies and programmes. Data disaggregated by age through the older end of the human lifespan are increasingly needed for policy analysis, formulation and evaluation to be adequately grounded in evidence.

Facilitate orderly, safe, and regular migration and mobility of people. International migration has been on the rise and could gain further prominence this century for demographic, technological and climatic reasons. Demographic differences among countries are one factor of international migration. Some countries are experiencing the labour-constraining effects of low fertility, slow or negative growth of their working-age population, and population ageing. Others have an increasing labour supply supported by high fertility and the rapid population growth associated with youthful populations. Technological innovation that displaces low-skilled workers and at the same time accelerates global demand for skilled

workers is also likely to continue to incentivize international migration in the future. Climate change could become a major driver of human migration due to displacement, mostly within countries rather than across national borders.

For all of these reasons, migration and human mobility are bound to remain closely linked to sustainable development, providing opportunities and benefits for migrants, host communities and countries of origin, as well as challenges when poorly regulated. The Global Compact for Safe, Orderly and Regular Migration recognizes that a cooperative approach is needed to optimize the benefits of migration, while addressing its risks and challenges for individuals and communities in countries of origin, transit and destination. Among the most common policies in this domain are those that entail interministerial coordination on migration, and cooperation agreements with other countries, including on return and readmission. Also common are policies to address trafficking in persons and migrant smuggling, and provisions to protect unaccompanied minors or separated children (United Nations, IOM and OECD, 2019). More progress is needed in the domain of migrant's rights and access to services, where fewer governments have a wide range of policies.

Promoting lifelong health and preventive care helps to maintain the functional capacity and well-being of individuals throughout the life cycle. As populations age, ensuring equitable access to basic health care, disease prevention, treatment and rehabilitation during all stages of life becomes more important than ever. Health and long-term care systems should include the provision of age-appropriate integrated care to maintain the intrinsic capacity of older persons. Technology can be of use to older persons in addressing specific needs, including related to health care.

Establishing universal social protection with adequate benefits is key to reducing poverty and inequality, and to promoting social resilience and inclusion. Although comprehensive social protection systems require significant investments, the recurrent costs of providing basic social protection floors are affordable in most countries. Universal coverage can be achieved through either contributory and non-contributory schemes or a mix of the two, and a minimum set of tax-financed schemes available to all throughout the life cycle. These systems should include people working in the informal sector and in unpaid care, many of whom are women. Special measures tailored to the needs of certain disadvantaged groups may be necessary to ensure effective coverage and sufficient benefits for all.

Eliminating age-related discrimination, including age barriers in employment, would make an important contribution to reducing inequality, increasing productivity and promoting economic growth. While ensuring that older persons are covered by social protection programmes, providing employment opportunities to all those who want to work is a key policy priority underpinning the rights and dignity of older persons. Policies in this area include those to eliminate age barriers in the formal labour market, promote the recruitment of and flexible employment opportunities for older workers, and ease access to microcredit and other incentives for self-employment. With people living and working longer, employers are taking advantage of intergenerational teams that can offer the right combinations of experience and skills.

Promoting retirement savings can provide a supplementary source of income in old age, improve the financial independence of individuals and support aggregate capital accumulation. In many middle- and low-income countries, individuals secure their financial

well-being in old age mainly through their accumulated savings and family transfers. In fostering savings across the life cycle, governments should ensure that pension funds are managed efficiently, that management fees are competitive, and that the financial products and investments offered are safe, affordable and actuarially fair, starting at young ages. Enhancing financial literacy, providing incentives for saving, and easy or default enrolment schemes have been proven to increase retirement savings.

Adopting social security reforms to account for the widening gap in longevity by socioeconomic status could contribute to reducing inequality. Raising the retirement age in proportion to increasing life expectancy is a long-recognized tool to promote the fiscal sustainability and intergenerational equity of retirement pension systems. It can also support labour force participation at older working ages.

But when reforming social security systems, it is equally important to consider the welfare implications of a widening gap in life expectancy by socioeconomic status. Reforms should therefore consider occupations that entail more physically demanding work that may warrant earlier retirement ages, and ways to ensure at least a minimum floor of benefits, for example, through universal social pensions as a complement to contributory schemes.

Adopting automatic adjustment mechanisms for public pension systems to respond to changes in population age structure would eliminate the need for periodic (and politically difficult) ad hoc adjustments to achieve fiscal balance. It would also reduce uncertainty about future benefits and allow individuals to better plan for their retirement. But such reforms must not sacrifice benefit adequacy for fiscal sustainability. At present, about half of OECD countries have some form of automatic adjustment mechanism to adjust pension parameters in response to demographic changes such as rising life expectancy or changes in the ratio of the older population to the working-age population (OECD, 2019).

Taking a balanced approach to financing old-age consumption can foster generational equity and fiscal sustainability. Public policies affect both current and future generations. Current generations bequeath a wealth of tangible assets and knowledge to future generations. They may also pass on public debt for which future generations will be responsible. Balanced approaches to financing old-age consumption include a mixture of public transfers, private transfers, work and savings to spread the fiscal pressures associated with population ageing over time and across institutions. Periodic assessments of the fairness and sustainability of such transfer systems provide essential information to evaluate, formulate and monitor relevant policies and programmes.

UN Photo / Kibae Park

Urbanization 4

Among the megatrends considered in this report, urbanization is the most certain. Between 2020 and 2050, globally, the portion of people living in urban areas will shift from 53 per cent to 70 per cent. This trend is undisputed and irreversible. In 30 years, cities and towns will contribute two thirds of world economic output and consume 80 per cent of the planet's natural resources. In 2030, when the international community may plan to establish global targets for 2045, achieving sustainable development will rest squarely on sustainable urban development (United Nations, 2018b).

Given its breadth and scope, urbanization is arguably the most complex of the megatrends. It spans issues of economic transformation, environmental sustainability, and inclusion and poverty eradication. The process by which a country shifts from mostly rural to mainly urban has implications for agriculture, industry and services, and how these can be combined to transform the economy. When capital, labour, technology and talent agglomerate in urban areas, countries can kickstart innovation, boost productivity and use resources more sustainably, while also creating markets for fresh and locally processed foods that stimulate agriculture crucial to rural livelihoods.

This chapter begins by analysing urbanization trends, patterns and drivers, considering the close relationship between urbanization and economic transformation. A review of key opportunities and challenges of urbanization follows, related to the 2030 Agenda for Sustainable Development. It touches on inclusion, housing, informality, resilience, homelessness, food security and sustainability. The chapter then examines links between urbanization and other megatrends. It emphasizes how urbanization lowers fertility rates and influences population age structure, and how sustainable urbanization is essential for climate action, while the opposite threatens the planet. Technology and inequality are also considered, specifically in terms of how technological innovation can enhance productivity and planning in cities, and how balanced territorial national development and inclusive urban development are key to shared prosperity, and declines in inequality and discrimination.

Policy recommendations sketch how to harness opportunities and mitigate challenges from urbanization to make progress on the 2030 Agenda. Proposals cover national urban policies, national development and economic planning that integrates urbanization and economic transformation, the urban economy and finance, and industrial policies to enhance urban productivity. They also comprise food loss and waste policies, the circular economy and urban waste management, and inclusive urban planning. The chapter concludes with examples of the role of the United Nations in supporting countries to promote sustainable urban development through data analysis, financing and convening diverse stakeholders.

Urban policies and investments in infrastructure can orient services, agriculture and industries in ways that harness opportunities and mitigate the challenges of urbanization.

Trends, patterns and drivers

Urbanization and spatial dimensions of sustainable development

A broad view of urbanization reveals how it affects both rural and urban areas, various subregions in a country, and connections between rural and urban areas, subregions and networks of cities. Seeing the phenomenon across the parts of a broader national territory deepens understanding of the interplay between urbanization and sustainable development.

Urbanization influences agricultural production and rural livelihoods as much as the economy of cities. It can decrease the proportion of people living in rural areas, escalate demand for rural food production from growing urban populations, and trigger investment in light industry and services in intermediate cities and towns in subregions that are largely rural. Urbanization can spawn urban infrastructure and services, and create new growth and employment opportunities in industries and services and, in some countries, urban and peri-urban agriculture. Left unmanaged, however, urbanization can result in cities that perpetuate environmental degradation, poverty, inequality, informality and unemployment.

Analysis across geographies helps illuminate the impact of urbanization on all parts of a country. Economic development is rarely balanced among subnational regions. Some achieve higher standards of living, while others lag behind. Urbanization can either reinforce geographical (spatial) inequalities or hasten social and economic development that is more balanced and benefits all territories. The latter requires consideration of how national urban policy is embedded in national economic planning and development. That is, how urban policy and spatial planning can guide investments in infrastructure (road, rail, air, seaports, electricity), in information and communication technologies (ICT), and in economic vehicles such as special economic zones. And how such policies and investments can orient services, agriculture and industries in ways that harness opportunities and mitigate the challenges of urbanization.

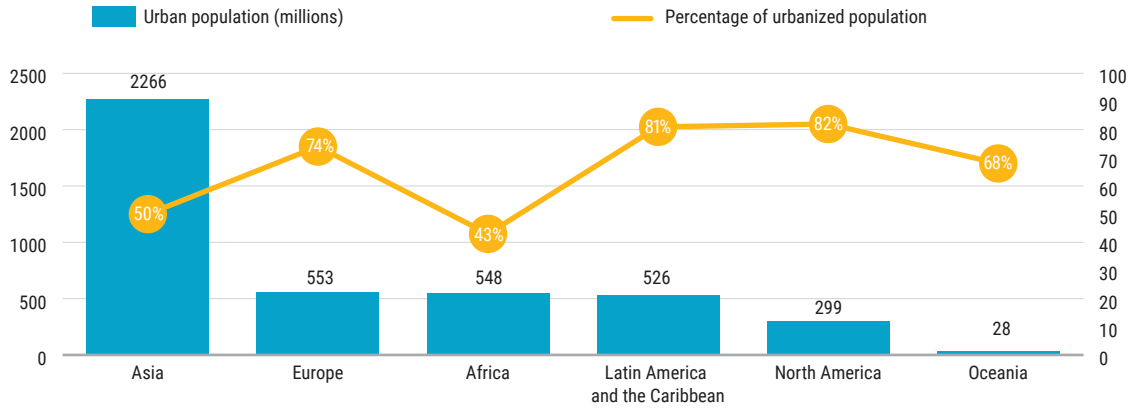
An urbanizing world

Urbanization[1] and its corollary, urban population growth, are unfolding globally (figure 4.1). A little more than 55 per cent of people now live in urban areas, about 4.2 billion people in 2018. In 1950, about 30 per cent or over 750 million people lived in urban areas, while two thirds remained in rural areas.[2] By 2050, about 68 per cent or two thirds of the global population will have settled

1 It is important to distinguish the terms "urbanization" and "urban population growth". Demographers define urbanization as the increasing share of the population living in urban areas (Poston and Bouvier, 2010). Urban population growth is the absolute growth in numbers of people living in urban areas. This implies that if urban and rural populations are growing at the same rate, then the urbanization rate is zero. Conversely, if the total population is unchanging but urban population is growing, then all urban population growth can be attributed to the increase in the proportion of people living in urban areas, the rate of urbanization (IOM, 2015).

2 What is "rural" and what is "urban"? The United Nations Global Statistical Commission has made considerable progress in demarcating rural and urban areas, and adopting internationally recognized definitions (European Commission et al., 2020). This said, most countries define urban areas in different ways, making comparisons difficult. Some use population criteria (e.g., more than 20,000 persons) or population density. Others use administrative criteria (IOM, 2015).

FIGURE 4.1 URBAN POPULATION AND SHARE BY REGION



Source: United Nations, 2018b.

in urban areas, bringing the population there to about 6.7 billion (United Nations, 2018b).

Natural population growth and changes in urban population shares will add an estimated additional 2.5 billion people to urban areas, with about 90 per cent of this growth occurring in sub-Saharan Africa and Asia. Africa is still predominantly rural; just 24 of 54 countries on the continent have crossed an urbanization threshold of more than 50 per cent. Over a third (35 per cent) of urban population growth will occur in just three countries: India with 416 million people, China with 255 million and Nigeria with 189 million (ibid.).

Along the urban-rural spectrum, rural areas have seen low population growth since 1950. They had an estimated 3.4 billion dwellers by 2018. Slow growth is expected to continue gradually and peak in a few years, before declining to around 3.1 billion people by 2050. Africa and Asia host the largest rural populations and will continue to do so until 2050, with China and India having exceptionally high numbers at 578 million and 893 million people, respectively (ibid.).

The megacity is defined as a metropolitan area with a population of more than 10 million inhabitants. It has been described as the urbanization trend of the twenty-first century. In 1950, there were only two megacities, Tokyo and New York. By 2020, there were 29, up from 12 in 1990. By 2030, the number of cities with 10 million or more inhabitants will likely climb to 43 (ibid.). New Delhi will become the world's largest city with a population of 39 million, followed by Tokyo at 37 million and Shanghai at 33 million. In the recent past, the Global South, notably Asia, has overtaken northern regions in having the greatest number of large urban agglomerations (World Economic Forum, 2019).

This said, future urbanization and urban population growth will take place in small and intermediate cities of 500,000 to 1 million inhabitants. Some of the fastest-growing urban agglomerations are cities with less than 1 million residents. While one in eight people live in megacities globally, almost half of urban populations dwell in small agglomerations of less than 1 million people. The proliferation of roughly 3,000 small agglomerations poses

significant implications for housing, basic services and livelihoods, politics and forms of social organization (United Nations, 2018b).

Drivers of urbanization and urban population growth

Four broad factors drive urbanization and urban population growth: natural population increase, rural-urban migration, rural to urban land conversion, and international migration. The key driver of urbanization, or the proportion of the total population living in urban areas, is rural-urban migration. Factors contributing to urban population growth, or the increase in the number of people living in urban areas, comprise natural population increase, rural-urban migration and international migration. Reclassification contributes both to urbanization and urban population growth.

Urbanization expands through the movement of people from rural to urban and peri-urban areas, and it subsumes the reasons that "push" people from rural areas and "pull" them into urban ones. Economic push factors include unemployment or underemployment in rural areas, low wages and no assets, as well as a lack of arable land (Hoffmann et al., 2019; Fischer, 2011; Ali et al., 2015). Land unavailability in rural areas is further exacerbated by cultural norms such as inheritance systems in which land is divided among multiple descendants. The absence of arable land hinders prospects for large-scale agriculture and mechanization to boost productivity. Non-economic push factors include poor rural infrastructure, housing, health care, education, and water and sanitation services. Economic and non-economic pull factors include better employment opportunities in cities, higher wages, improved facilities and infrastructure, and greater protection from conflicts (Moses, Guogping and John, 2017; Hoffmann et al., 2019; Ali et al., 2015). Pull factors in some countries are lessening, however, given deteriorating conditions in informal urban settlements.

Quantifying flows of migration between rural and urban areas is a complex task. Data are not readily available, or if they are, they are not disaggregated or comparable. This is especially so in low-income countries. A study of 31 countries (FAO, 2018b) showed that a larger share of the population that migrated did so between rural areas (22 per cent for men and 26 per cent for women) than from rural to urban areas (16 per cent for men and 17 per cent for women). The population share of rural-urban migrants was larger than the share that migrated from urban to rural areas (8 per cent for men and 6 per cent for women). This points to a net rural to urban migration flow of around 10 per cent of the population for both men and women (IOM, 2015). Rural-urban migration, while varied across geographies, continues to shape urbanization (FAO, 2018b).

Natural population growth is the single most important determinant of expanding urban populations. It is related to the population growth of a country at large. High rates of urban population growth are found in countries with significantly high natural population growth rates, notably in East and Southern Africa. Historically, natural population growth was regarded as less important to urban areas, but an early comprehensive analysis (United Nations, 2001) showed that the impact of natural population growth in Africa explained up to 75 per cent of urban growth in the 1980s. More recently, an estimated 60 per cent of growth in urban populations stems from natural increases (UN-Habitat, 2013). In countries where the natural population is decreasing, such as Germany and Japan, the rate of natural increase is negative.

Individual studies offer more nuanced perspectives. Rogers (1982) suggests that while natural population increase contributes the highest percentage of urban population growth in less developed countries, at 60 per cent, rural to urban migration is the main driver in the developed countries of Europe and in the Russian Federation, contributing about 67 per cent. Recent research finds similar results (Hommann and Lall, 2019), implying that drivers of urbanization in developing countries are natural factors of fertility and mortality, while those in developed countries are economic factors attracting rural populations to cities. Farell (2017, p. 44) underscored distinguishing between rapid urbanization and rapid urban growth, noting, "the principle effect of rural to urban migration is to establish the level of urbanization, whereas urban natural population increase is to increase the rate of urban growth".

Reclassification or conversion of rural areas, a determinant of both urbanization and urban population growth, refers to the establishment of new municipal administrative boundaries to include a larger geographical area. The city, as newly defined, has essentially swallowed areas previously demarcated as rural. The result of this practice, when undertaken in multiple municipalities throughout a country, is that the proportion of the total population living in urban areas increases. An estimated 20 per cent of the increase in urbanization comes from the reclassification of settlements (UN-Habitat, 2013). Reclassification increases urban population growth by including people in peri-urban areas and locations that are semi-rural in appearance yet classified administratively as urban.

International migration concerns migrants crossing national borders who locate in urban and peri-urban areas rather than rural ones. Since 1970, the absolute number of international migrants has been increasing, reaching 271 million by 2019. A general pattern is movement from low- and middle-income countries to high-income countries. As of 2019, two thirds of all international migrants worldwide or 176 million lived in high-income countries. Just about 82 million resided in middle-income countries and 13 million in low-income countries (IOM, 2020).

Increased movements of people around the world accelerate the shift towards cities, as migrants pursue basic services and opportunities typically found in urban areas. While statistics on the number of migrants in cities are scanty, particularly in developing countries, where such data could be vital for planning, cities and urban areas continue to be preferred destinations. This increases urban populations and urban population shares. While international migrants contribute to the growth of urban populations, they do not add to the decline in the rural population of the host country, although they may contribute to such a decline in the country from which they come. With increasing global connectivity, international migration will likely continue rising, requiring nations and cities to factor foreign populations into urban policies.

Urbanization and economic transformation

Four features typical of structural transformation in development are changes in the proportion of labour in rural and urban areas (the rural-urban labour shift), the decline of agriculture as a proportion of total employment and output, reduced fertility and mortality, and increasing urbanization. As populations and regions urbanize, employment tends to shift from the agricultural sector to manufacturing

and services. In high-income countries, the process has evolved with simultaneous industrial development. In many developing countries, however, urbanization has not been accompanied by industrialization. The absence of employment in manufacturing has contributed to informality in the service sector and to impoverished human settlements as urban areas cannot absorb the expanded labour force (Gollin, Jedwab and Vollrath, 2016). The presence of informal labour and slums even in industrialized countries reminds us, however, that manufacturing is no panacea. It needs to come with affordable housing, social protection and inclusive urban planning to be sustainable.

While urbanization has reduced the proportion of labour in agriculture, employment in agriculture remains important. The bulk of food consumed worldwide is produced locally. On average, only 19 per cent of agricultural production is traded internationally. Improved agricultural productivity in developing countries will be crucial in ensuring food security, given an expected 50 per cent spike in food demand by 2050 (Alexandratos and Bruinsma, 2012).

Highly urbanized countries like Japan (92 per cent), the Netherlands (91 per cent), Australia (86 per cent) and Canada (81 per cent) have minimal percentages of the labour force working in agriculture (between 1.2 and 3 per cent), and very high shares in services and industry. Less urbanized countries such as Kenya (27 per cent), Nigeria (30 per cent), Lao People's Democratic Republic (35 per cent) and India (34 per cent) tend to have a higher share of the labour force in agriculture. Their shares are about 75 per cent, 75 per cent, 73.1 per cent and 44 per cent, respectively. This said, in Africa, agriculture's contribution to GDP is declining (Barret et al., 2017)

The challenge for countries in Africa and Asia will be to manage urbanization in ways that boost agricultural productivity to meet the food requirements of growing, increasingly urban populations. At the same time, they need to ensure that people currently working in agriculture can secure meaningful employment in the future. Countries will need to raise productivity, for example, by improving the yields of smallholder farmers rather than relying solely on the expansion of large-scale commercial farming. Unregulated agribusinesses could both threaten biodiversity and significantly reduce employment. This would accelerate the urbanization of poverty as displaced rural smallholder farmers migrate to urban slums.

In addition to finding a balanced approach to agricultural productivity, countries need to harness urbanization to industrialize, advancing productive or industrial policies aimed at urban agglomerations and making the most of the roles of cities in the broader economy. Both developed and less developed countries have implemented economic transformation programmes for private sector development, job creation and value addition that have enabled higher productivity and regional integration, as well as supply chain approaches tied to innovation and equity (Lin, 2012; IADB 2010, 2014). Substantial evidence exists in high-income countries suggesting that productivity in large urban settlements is higher than in smaller ones (UN-Habitat, 2015; Turok and McGranahan, 2013). The same is likely valid for low-income countries, although the evidence is much less clear (World Bank, 2008). Still, productive policies there should also target and integrate urban and rural value chains.

Many economists consider "agglomeration economies" as the distinct advantage of cities

and urban areas. These are economies in which firms and people enjoy positive externalities from the spatial concentration of economic activities. They are also referred to as "localization economies" (Fujita and Thisse, 2002). Among the many benefits of agglomerated economies are gains from economies of scale, where firms enjoy lower per unit costs for large-scale production, and reduced unit transport and transaction costs. The provision of urban services also cuts unit production costs.

Agglomeration economies have a positive knowledge spillover effect that is especially important for technological and innovation industries. The larger the concentration of firms, the higher the opportunity to exchange knowledge and ideas, often without monetary transactions (Saxenian, 1994). Agglomerated economies offer benefits through sharing, matching and learning (AfDB, OECD and UNDP, 2016).[3] Learning is promoted as the density of economic actors facilitates the diffusion of knowledge and technology. Further, given their high level of economic activity and large-scale economic processes and markets, cities have a higher capacity for infrastructure such as airports, highways and educational institutions.

Agglomeration economies have a critical link with urban planning, as cities that are better planned can organize and facilitate the movement of goods and people, and provide a more efficient urban layout for supply chains (UN-Habitat, 2015, 2017). Value and supply chains are essential connectors between cities and rural settlements.

A STIMULANT OF ECONOMIC GROWTH

Urbanization's contribution to economic growth stems from higher productivity and the more rapid productivity changes in cities. In the early stages of urbanization, the shift of the labour force from rural to urban employment significantly stimulates economic growth. As urban areas and cities grow, a second factor, faster productivity gains, takes effect and dominates after that point. Research by the Commission for Growth and Development (Spence, Annez and Buckley, 2009) on high-income countries found that average productivity per worker in urban manufacturing and service sectors was three to five times higher than in traditional rural agricultural sectors.

There is a positive correlation between urbanization and economic growth. Almost all countries have reached 50 per cent urbanization by the time they attain middle-income status. Moreover, all high-income countries are more than 75 per cent urban. The least developed countries of Africa and Asia have the lowest urbanization rates. As of 2018, Africa and Asia had urbanization rates of 43 per cent and 50 per cent, respectively. In contrast, the most urbanized regions were North America (82 per cent), Latin America and the Caribbean (81 per cent), Europe (74 per cent) and Oceania (68 per cent). In 2018, North America had a GDP of $24 trillion, while Asia (excluding China and Japan) and Europe had $12 trillion and $22.6 trillion, respectively. Africa's GDP was only $2.3 trillion (United Nations, 2018b).

3 Sharing occurs when firms and local urban inhabitants share indivisible facilities and achieve joint economies of scale in local infrastructure, services, risks, and the production of specialized inputs and final goods. Matching arises from larger pools of employees, firms, buyers and suppliers that help each firm or individual find the specific attributes demanded.

While no nation has achieved economic growth without urbanization,[4] not all countries that experience rapid urbanization achieve corresponding increases in economic growth (Spence, Annez and Buckley, 2009). Urbanization in Africa, Latin America and South-East Asia has failed to induce sustained economic growth, unlike in other developing regions of the world. What is essential, then, is the type of economic transformation that accompanies urbanization.

Africa offers an explicit example of how urbanization does not necessarily provide growth and development (Castells-Quintana and Wenban-Smith, 2019). By 2050, Africa's urban population is expected to double, but the continent's preparedness for this is in question. Sub-Sahara Africa already hosts the highest proportion of urban residents living under the poverty line, at 43 per cent, while 62 per cent of city dwellers reside in slums (UN-Habitat, 2016). Rapid population growth and a burgeoning youth bulge add to Africa's potential demographic challenges as economies are not creating enough jobs. An estimated 72 per cent of the urban labour force is informally employed (ILO, 2019), in work characterized by low skills and productivity. Such jobs are insecure, and generate little household income and no taxes to finance better public services (Turok, 2013). The region also contends with a crippling urban infrastructure gap estimated at $130 billion to $170 billion annually (AfDB, 2018).

A NEED FOR GREATER INVESTMENT

Urbanization brings challenges requiring considerable investment to solve. Estimates from the Global Infrastructure Hub show that the world will face an investment gap in city infrastructure of about $15 trillion by 2040 (UN-Habitat, 2020b). Filling the gap demands new and innovative approaches to financing. According to the World Economic Forum, a vast supply of capital is available, but much of it is tied up in institutional pension, sovereign and insurance funds, and private endowments. This funding is not easy to reach as rates of return in developing countries require higher interest rates to compensate for risks. Improving governance and legal frameworks for private sector investment will be essential. A small but increasing number of impact investors are willing to put money into socially and environmentally responsible initiatives that generate modest returns. Development banks and other financial institutions are also avenues for financing for cities if they include urban development in their portfolios.

While different types of financing are available, the conditions necessary to attract capital to urban infrastructure projects are often not. Institutional and private investors need to see that cities can generate reliable sources of revenue to service debt, finance bond instruments and maintain equity investments. Taxes derived from land and property offer an essential source of revenue. In most cities in developing countries, however, property taxes are cumbersome and costly to administer. The lack of updated land registries and transparency, along with unreported private transactions, and underdeveloped and overregulated property markets further hinder property taxation as a viable option for infrastructure financing.

A few countries have managed to raise funding by capturing land asset values in transactions with the private sector, notably in Asia, North

4 Some data on cities' national GDP contributions in Africa strengthen this argument: 75 per cent in Botswana, 65.5 per cent in Cameroon, 57.6 per cent in Ethiopia, 70 per cent in Kenya, 65 per cent in Madagascar, 58 per cent in Malawi, 57.9 per cent in Nigeria, 62.2 per cent in South Africa, 72.6 per cent in Sudan, 60 per cent in Togo, 85 per cent in Tunisia and 70 per cent in Uganda (New Urban Agenda, 2016).

America and Western Europe. Examples in Asia include China especially as well as Hong Kong, SAR of China; Japan; the Republic of Korea; and Taiwan, Province of China. Recent examples in Latin America are Brazil, Chile, Colombia and Mexico. Cities are also exploring domestic sources of finance, including municipal bonds, securitization and privatization of underutilized assets. Some cities are exploring mechanisms to leverage their assets to raise funds, for instance, through leasing public properties. But there are serious challenges in adherence to the rule of law, accountability and transparency.

Opportunities and challenges for sustainable development

While associated most closely with SDG 11 on cities and communities, urbanization links with multiple SDGs. Countries that harness urbanization can reduce poverty and inequality, create prosperity through gainful employment and social protection, promote environmental sustainability, and contribute to peace and resilience. These key elements of the 2030 Agenda, however, are at great risk in countries that fail to plan for urbanization and manage urban population growth.

CITIES AS OPPORTUNITIES FOR INCLUSION

Connecting people, functions and markets, cities harness agglomerative benefits to provide public services at scale, strike connections across industries, efficiently match employment opportunities, and generate positive spillovers from sharing technology and knowledge. They can provide the basis for an equitable distribution of resources, services and human potential. Even as urbanization offers great promise, however, if it is poorly managed, it undermines inclusion and deepens poverty.

When they properly manage population density and concentrated economic activities, cities play an effective role in distributing resources. They offer the poorest populations opportunities for higher incomes and improved productivity, for instance. They increase access to infrastructure and services among the poor due to economies of scale and scope. It is up to three times more cost-effective to provide urban services in dense cities than to a dispersed population (The World Bank and IMF, 2013).

Higher incomes associated with urban economic growth can reduce the poverty of both urban and rural populations (Ravallion, Chen and Sangraula, 2007). Those moving to cities from rural places often send remittances back home. Many straddle the two areas, taking income earned in employment in cities and investing it in rural agriculture, small businesses and trade. Rural-urban migration may also reduce competition for jobs in rural areas.

The interconnectedness of people, functions and markets makes cities not just places of economic opportunity but also of social inclusion. They have a key role in accelerating SDG 5 on gender equality, empowering women, and institutionalizing programmes and policies to significantly reduce gender-based violence, bias and inequality. Many women and adolescent girls gain significant chances to improve their standards of living.

At the same time, gaping disparities persist in how women and men experience the urban environment, such as stark differences in mobility patterns. In developing countries, while men's movements are often straightforward, such as routine trips from home to work and

back, women's patterns involve multiple short trips that may include dropping off and picking up children from school, bringing water, running errands and visiting relatives. In more urbanized areas, many women experience a lack of safety in public spaces. In Egypt, for instance, 83 per cent of women have been sexually harassed on Cairo's streets (Fleming and Tranovich, 2016). Every 29 minutes, a rape is reported in New Delhi, and only 12 per cent of women in Lima feel safe (WHO, 2014).

While cities increase access to basic services and employment overall, these benefits are not shared equally among women and men. Women often face economic instability due to low-income jobs, gender pay gaps and discrimination in labour markets. Worldwide, women are overrepresented in informal work. According to Cities Alliance (2020), 80 per cent of women in non-agricultural jobs in South Asia are in informal employment. The share is 74 per cent in sub-Sahara Africa, and 54 per cent in Latin America and the Caribbean. These challenges are exacerbated by the paucity of women in city governance. In Europe, only 15 per cent of mayors are women (Kneeshaw and Norman, 2019). This kind of acute gender gap means women's issues are typically ignored in urban policy formulation and planning.

HOUSING, SLUMS AND SETTLEMENT UPGRADING

Urbanization drastically increases demand for housing in cities and metropolitan areas. This poses difficulties for any city, but is particularly challenging for those with existing deficits in the housing stock. Ensuring the availability of and access to affordable, well-located, quality housing in urban areas is a problem that cuts across economic classes. Rapid urbanization combined with inadequate urban planning propels the growth of housing that is of poor quality and located at a distance from services, employment and social networks.

Lack of access to adequate housing is one of the greatest contributors to economic inequality, largely through the proliferation of slums. The global proportion of slum dwellers declined from 46.2 per cent in 1990 to 29.7 per cent in 2014 (UN-Habitat, 2015). While this may seem like progress, the absolute number of slum dwellers has been increasing and is projected to continue climbing. In 1990, there were nearly 715 million slum dwellers. This number rose to nearly 1.2 billion by 2018, with 80 per cent in East Asia and South-East Asia (370 million), sub-Saharan Africa (238 million), and Central and Southern Asia (227 million) (United Nations, 2019). The housing gap already takes a toll on economies and the environment, a cost likely to grow as the urban population rises by an additional 2.25 billion people by 2050 (United Nations, 2018b) b. With one in every three city dwellers living in slums, informal settlements characterized by poor access to sanitation, electricity, clean water and secure tenure have been "normalized", pointing to a fundamental absence of housing rights.

Overcrowded, substandard housing facilitates the spread of infectious, parasitic and vector-borne diseases, such as tuberculosis, hepatitis, dengue fever, pneumonia, cholera, malaria and corona viruses, undercutting prospects for healthy lives under SDG 3 Poor sanitation and lack of access to clean drinking water stall progress on SDG 6, which calls for access to water and sanitation for all. Such shortfalls contribute to prevalent diarrhoea, which increases the transmission of communicable diseases and undermines the ability of affected children to retain nutrients necessary for mental and physical development (UNICEF, 2015). The lack

of structurally sound, climate-adapted and ventilated homes further endangers the health of slum dwellers, including from extreme events related to climate change, such as heat waves, severe cold and storms. Unplanned urban development exacerbates respiratory diseases related to outdoor and indoor air pollution.

Slum areas are generally not part of city infrastructure networks of health-care services. The absence of services and inadequate housing have sparked organized actions by slum dwellers and their organizations. In countries as diverse as Brazil, Ghana, India, Kenya, Nigeria, the Philippines and South Africa, federations of slum dweller associations have engaged municipal governments to improve living conditions. This has involved enumerating slums, setting precedents with better housing designs, defining alternatives to violent evictions and developing area-based plans. Grass-roots women's organizations and informal sector workers have forged alliances with these initiatives, creating a powerful constituency for policy advocacy.[5] A growing number of local governments work directly with the urban poor to scale up participatory slum upgrading programmes.

CITIES IN CRISIS: RESILIENCE, DISPLACEMENT AND PEACEBUILDING

Global crises are growing in frequency. They are complex, multidimensional, recurrent and cut across geographical borders. They are increasingly integrated within the urban landscape. Cities and their inhabitants can be directly affected by natural and human-made disasters, or be epicentres of crises as with COVID-19. They may absorb people forcibly displaced from other areas.

The unprecedented increase in the global urban population by 2050 will heighten urban vulnerability to crisis. Cities in developing countries already face significant risks, with over 1.2 billion people globally clustered in informal settlements. While SDG 9 calls for resilient infrastructure, these settlements fall short of this goal. Those located in low-lying coastal areas are increasingly prone to flooding or other extreme weather events (Dodman et al., 2013).

Large numbers of forcibly displaced migrants in urban areas further heighten risks from protracted conflicts. By 2015, almost 60 per cent of all refugees lived in urban areas. This figure has likely increased as complex conflicts continue to grow. In the same year, more than 50 per cent of internally displaced people lived in urban areas (Park, 2016).

Intensifying conflicts and crises in urban areas pose challenges for humanitarian organizations in responding to them, as many of their interventions have been designed for rural areas (Earle, 2016).

Working in cities in crises requires innovation and new approaches. Humanitarian practitioners are increasingly establishing city-level coordination mechanisms that integrate international, national and local stakeholders. A growing number of governments promote approaches based in urban settlements, and systematically engage and build local capacity, including by applying innovative funding mechanisms so local actors can run effective programmes for resilience and rehabilitation.

5 Three key organizations are Slum and Shack Dwellers International, the Huairou Commission of grass-roots women's organizations and Women in Informal Employment Globalizing and Organizing.

A GROWING NUMBER OF HOMELESS PEOPLE

Homelessness is a complex phenomenon. It operates at the intersection of urban inequality, unemployment, violent forced evictions, gender disparities, urbanization, racial discrimination, mental health, housing affordability and substance abuse. Perhaps because of this complexity, homelessness has varying, sometimes conflicting definitions, posing challenges for statisticians (box 4.1). Recent research, however, suggests that about 2 per cent of people globally are homeless, about 154 million in total. As cities grow, so will the number of homeless people (Chamie, 2020).

The absence of affordable housing has a direct impact on homelessness. In urban settings, rental housing and the associated costs of living (utilities, energy, transportation or transit access) make living more expensive than in rural areas. Municipal authorities often fail to provide adequate low-cost housing for the poorest that is within reach of income-earning activities and served by good, affordable transport links. These problems are compounded by the gentrification of settlements, which drives up rents, along with the absence of tenant rights and/or insecure land tenure. Forced evictions, often undertaken illegally during urban development, contribute to homelessness (Speak, 2019).

Natural disasters are another common cause of homelessness in some places. The displacement of over 1.6 million people due to the 2010 earthquake in Haiti, and of more than 2.5 million people in Bangladesh and India through Cyclone Fani in 2019 are recent examples. Unemployment and underemployment and the absence of social protection feed homelessness, as do forms of social exclusion associated with ethnicity and race, public health and mental illness, and domestic violence, among other factors.

Homelessness has demographic implications. While many studies indicate that the homeless are predominantly men, the proportion of women might be highly underestimated. This

BOX 4.1 BROADENING THE DEFINITION OF HOMELESSNESS

The United Nations (2020) recommends an integrated definition of homelessness. Primary homelessness (or rooflessness) includes persons living in streets or without a shelter that would fall within the scope of living quarters. Secondary homelessness comprises persons with no place of usual residence who move frequently among various types of accommodation (including dwellings, shelters or other living quarters), and persons usually resident in long-term (also called "transitional") shelters or similar arrangements for the homeless.

At the 2020 session of the Commission on Social Development, United Nations Member States deliberated on a still wider definition of homelessness. In addition to primary and secondary homelessness, it includes persons living in inadequate housing characterized by a lack of basic services, tenure security and safety – for instance, all persons living in slums and informal settlements. The Commission also considered including refugees, migrants and internally displaced people, many of whom occupy temporary housing arrangements or live in informal settlements (Commission on Social Development, 2020).

may be caused by narrow definitions of homelessness that only include those sleeping on the street. Child homelessness is also on the rise in many countries, including in areas of conflict or with public health crises such as HIV/AIDS.

The homeless are among the most active advocates to end homelessness. In developed and developing countries, they are driving change by producing street papers, monitoring homeless shelters and lobbying for municipal strategies to create transitional housing. Organizations such as the United Kingdom-based Railway Kids support homeless children to reintegrate with their families, working in inner-city settings throughout Africa. International homelessness organizations promote local and global solutions, including by mobilizing United Nations Member States to adopt resolutions at the General Assembly.

FOOD SECURITY, NUTRITION AND SUSTAINABILITY

With urban population growth, the attainment of SDG 2, to end hunger, achieve food security, improve nutrition and promote sustainable agriculture, is increasingly linked to sustainable urban development. Agriculture and food systems must meet the food and nutritional demands of urban populations with rising incomes and changing diets. At the same time, cities are important agents in sustaining rural development and providing access to healthy diets for all. Transforming food systems to meet a spectrum of needs requires changes in both rural and urban areas. These include linking small producers to fresh food value chains by increasing services, infrastructure and markets, and improving the availability of fresh and nutritious food in urban areas through short food supply chains. Also essential is support for peri-urban agriculture in large municipalities as well as small towns and medium-sized cities.

As urban systems expand, so do food needs. Where urbanization is rapid, poorly planned and not accompanied by growth in industry and service jobs, many people in cities will experience food insecurity and malnutrition. While food and economic crises have an impact on both rural and urban populations, the urban poor suffer much more, as urban consumers often depend on food purchases originating from rural areas or imported into the country.

When financial resources are lacking, many urban poor have no alternative but to turn to urban and peri-urban agriculture activities such as horticulture, short-cycle livestock and poultry, dairy production, aquaculture and agroforestry. This may be their only survival and livelihood option. But such activities can also significantly contribute to the urban fresh food supply chain and urban environmental management. They can turn urban waste into productive resources, such as through using treated wastewater for irrigation, and food scraps for compost and vermiculture. Shorter distribution networks lower the ecological footprint by reducing energy use for transport, packaging and cooling of food, among other effects (FAO, 2011). Urban and peri-urban agriculture can also help make cities greener and contribute to local biodiversity.

Territorial links between rural and urban areas show the full impact of economic downturns on hunger and malnutrition. Between 2011 and 2017, increases in hunger coincided with an economic slowdown or downturn in 65 out of 77 countries (FAO, 2019). Recessions have often led to rising unemployment and declining wages and incomes in urban areas, reducing demand for agricultural production from rural areas, lowering urban-to-rural remittances and

limiting rural farm investments. The extent to which rural and urban links weaken as the economy deteriorates determines impacts on agricultural and rural off-farm employment and the welfare of smallholder food producers. The impacts can be particularly sharp in low-income countries where agriculture makes up a large share of employment and economic activity.

Small towns[6] and small and intermediate cities[7] comprise 60 per cent of urban food demand. They can play a crucial role in sustainable agriculture, and improved food security and nutrition, contributing to SDG 2. Their proximity and close interaction with rural areas make them strategic sites for balancing territorial development.

Well-functioning rural and urban links can be indispensable to creating decent employment. While rural transformation is often equated with the shift away from agriculture, increasing demand in urban areas for high-value primary and processed products can offer multiple employment opportunities for rural and urban youth. Horticulture, aquaculture and dairy activities typically have higher labour or output ratios than grain, and create significant employment opportunities in post-farmgate, value added activities such as marketing, packing, cold storage and transport. Promoting integrated approaches can enhance mutually beneficial rural and urban flows of goods, services, capital and labour, particularly along agri-food value chains. Balanced territorial development and regional planning across rural and urban areas, combined with decentralization of public administration, are also important for natural resources management, particularly given resource depletion and climate change.

Urbanization as it relates to other megatrends

Urbanization relates directly to each of the megatrends highlighted in this report. By lowering fertility rates, urbanization propels demographic shifts. The battle to slow global temperature rise and protect the planetary ecosystem will be won or lost in cities. Technological innovation can enhance productivity and planning in cities but may also deepen the digital divide. Achieving equality and non-discrimination hinges on balanced national territorial development and inclusive urban development.

THE DEMOGRAPHIC IMPLICATIONS

The world's unprecedented shift in demographic trends means that almost all population growth projected by 2050 will be in the urban areas of less developed countries (United Nations, 2018b). At the same time, urbanization will accelerate a demographic transition from higher to lower mortality and fertility rates, both of which tend to be lower in urban areas than rural ones. In sub-Sahara Africa, for instance, household surveys conducted since the 2000s reveal that fertility in urban areas is below that of rural areas by at least one child per woman in 22 out of 23 countries (United Nations, 2015).

Lower urban fertility can stem from higher education levels, higher costs of childbearing and expanded access to family planning services. Additional factors influencing lower urban fertility are the higher costs of raising children in cities, greater job opportunities, higher ages of marriage and women with better education. Lower urban mortality results from

6 As noted, countries measure "urban" differently, some using a threshold of 5,000, others 10,000, 15,000, or 20,000. This report defines a small town as an urban centre of between 5,000 and 20,000 people.
7 Small and intermediate cities are agglomerations of 100,000 to 500,000 people.

a combination of advantages in cities, including greater access to health services, efficiencies in health-care delivery and higher incomes.

With half of the world's population now living in urban areas, and most rural to urban migrants in developing countries being young people, it is essential to explore links between urbanization and population age structure. Limited opportunities for economic development often drive young people to migrate from rural to urban areas. They seek better jobs and income, opportunities for entrepreneurship, and the benefits of modernity. The trend is particularly acute in Africa, where by the end of 2020, more than half the population will dwell in urban areas. More than 50 per cent of this urban population will be under age 19 (UNOWA, 2005, cited in Mabala, 2011).

Of the 60 per cent of the world's population living in cities by 2030, 60 per cent will be under age 20. Countries will need to create 470 million productive urban jobs over the next 10 years to accommodate this emerging global workforce (Saghir and Santoro, 2018). In Africa and parts of Asia, a shifting population age structure with a large share of young, working-age people presents an opportunity to harness the "youth dividend" to transform economies and societies. But to do so, countries must make the right investments in education, employment and elsewhere. Otherwise, the growing population of urban youth will inevitably be confined to poor-quality informal employment.

In 2018, the global rate of youth unemployment was 13 per cent, and while global data are not yet available on the impact of COVID-19, it is likely that the pandemic has significantly increased this figure; nearly 67 million young people between 15 and 24 years old report that they are actively searching for work but cannot find a job (ILO, 2020). In addition, urban youth, especially women, face challenges associated with crime, violence, sexual exploitation and homelessness.

Responding to the demographic dynamics of urbanization requires factoring considerations related to youth, ageing and gender into urbanization policies. This will be increasingly critical in determining the quality of future urbanization, and, more broadly, hopes for achieving sustainable development.

A REMARKABLE IMPACT ON THE PLANETARY ECOSYSTEM

By 2030, the number of cities with 1 million to 5 million people is projected to grow to 597. A further 710 cities are expected to have between 500,000 and 1 million inhabitants in 2030 (United Nations, 2018a). How these cities produce and consume energy, manage land use, construct infrastructure and buildings, consume water and food, and recycle and reuse waste will have a remarkable impact on the planetary ecosystem.

Urbanization directly affects land cover, including natural amenities and human-made structures, and land use. Changes in land use occur as a result of many factors, including demographic changes, economic transformation, new technologies and shifts in the political economy. Urbanization brings these factors together on a concentrated scale, making effective management of urban land use crucial for environmental sustainability.

The increased number of people living in cities significantly raises demand for energy, and the provision of electricity and transportation. About two thirds of global energy consumption comes from urban centres, a proportion expected to keep pace with rising urbanization worldwide (Smil, 2019; IEA, 2008). As hubs

of economic activity, cities contribute most of the world's greenhouse gas emissions, although questions remain about how exactly emissions should be assigned geographically (Hoornweg et al., 2011). Cities therefore both influence and are affected by climate change.

Usually, urbanization accompanied by increasing incomes and changes in consumer demands drives up energy consumption, such as through the growing number of electrical appliances in urban households (Madlener and Sunak, 2011) and daily travel to work. In rural areas, mobility may involve little or no fuel use, while urban transportation does, particularly as incomes increase. The concentration of people in cities requires construction and maintenance of transportation, sanitation and water facilities. Higher density living also induces shifts from traditional fuels to modern energy. While urbanization permits larger-scale and more efficient food processing, it is more likely to use more energy-intensive methods (Jones, 1991).

Urban areas remain vulnerable to climate-related disasters for several reasons. These include the characteristics of residents (cultural, demographic and economic), the institutional capacity of local governments, the composition of the built environment and the provision of ecosystem services. Vulnerability is also affected by the preparedness of a city's population and infrastructure, and the availability of essential emergency services and early warning systems (Revi et al., 2014). Resource exploitation and environmental degradation spurred by human activities such as the removal of natural storm buffers, pollution and overuse of water undercuts the resilience of cities, as does poor-quality, overcrowded housing development that exacerbates the "urban heat island" effect (Rosenzweig et al., 2015).[8]

Urban centres can be negatively impacted as climate change worsens land degradation, including through increases in rainfall, flooding, drought frequency and severity, heat stress, dry spells, wind, sea-level rise and wave action. Ongoing coastal erosion is intensifying through sea-level rise. Increased urbanization can also intensify extreme rainfall events, mainly due to the effect of aerosol emissions on rainfall (IPCC, 2019).

The ability of cities to deal with extreme, climate-driven events is mostly influenced by the quality of housing, buildings and infrastructure, and by how successfully land use management and urban planning have incorporated risk reduction measures within urban construction and expansion. Most cities are still dominated by impervious built infrastructure, for example. Changes in precipitation therefore cause increased surface runoff, which collects pollutants from urban surfaces and activities that end up in urban storm water systems. While the consequences of pollutants in water systems are well known, emerging pollutants such as pesticides, hormones and other synthetic chemicals may pose new problems (Fletcher, Andrieu and Hamel, 2013).

DIGITAL CONNECTIVITY LINKS CITIES AND BEYOND

Cities increasingly connect the world. They will continue to do so as part of the progression towards the digital economies

8 Reduced evaporative cooling caused by lack of vegetation, the presence of heat-absorbing materials, and production of waste heat together can make cities warmer than surrounding areas, a phenomenon called "the urban heat island".

and networks that thread economies together. Big data, artificial intelligence, cloud computing, robotics and other technologies are changing the course of human history.

The Global Connectivity Index 2015 underscores the importance of enhanced connectivity, socially and economically. The index has a positive correlation with GDP, so countries scoring higher have greater GDP per capita. Developed countries have led developing economies by about twofold in the supply, adoption and use of broadband, the cloud, the Internet of things, big data and data centres, five technologies now considered pillars of ICT infrastructure. Developing countries have achieved faster 3G coverage and mobile adoption, yet have not been as quick in building up data centre capacities (Huawei, 2015).

Despite progress in digital connectivity, research in 2017 in eight countries (Brazil, China, Germany, India, Japan, the Russia Federation, the United Kingdom and the United States) revealed gaps between and within countries, with about 1.75 billion individuals still digitally unconnected. The study found that 86 per cent of the unconnected are in China (649.38 million, about 47 per cent of the total population) and India (853.38 million, about 68.5 per cent of the total population). Countries with the lowest levels of unconnected people included the United Kingdom (12.8 per cent), Germany (13 per cent) and Japan (16 per cent) (IHS Markit, 2017).

The digital transition is a challenge for rural and urban areas. As shown in table 4.1, in all countries but China and India, the proportion of urban unconnected people is higher as a percentage of the total unconnected population. These countries are highly urbanized, however, with the majority of people living in cities. China and India are exceptions owing to their large rural populations.

TABLE 4.1 NUMBERS AND SHARES OF URBAN AND RURAL UNCONNECTED PEOPLE BY COUNTRY

Country	Urban unconnected *(millions)*	Urban unconnected *(percentage of urban population)*	Rural unconnected *(millions)*	Rural unconnected *(percentage of rural population)*	Urban unconnected *(percentage of total unconnected)*
Brazil	68.775	38.16	21.863	74.5	75.88
China	272.483	34.44	376.905	63.86	41.96
Germany	7.172	11.5	3.511	17.72	67.13
India	128.272	31.14	725.113	87.05	15.03
Japan	17.809	14.97	2.432	33.66	87.98
Russian Federation	25.575	23.55	13.76	36.31	65.02
United Kingdom	7.054	13	1.329	12	84.15
United States	62.125	23.29	16.276	28.29	79.24

Source: IHS Markit, 2017.

Large cities in developing countries experience lower levels of connectivity. São Paolo and New Delhi had the highest proportions of unconnected people as a percentage of total city population, at 36.13 per cent and 29.2 per cent, respectively. New York, Moscow and London had proportions of 18.7 per cent, 10 per cent and 7 per cent, respectively (ibid.). While comparative data on digital connectivity are limited, available data show that the benefits of digital technologies are not yet fully realized. Some barriers to harnessing them as economic drivers include the affordability of Internet connections, information technology illiteracy and low investments in ICT infrastructure.

Access to digital technology will be imperative for economies to reduce spatial inequality by connecting rural and urban areas, networks of cities and neighbourhoods within cities. Digital inclusion can in turn streamline government operations, attract investment, enhance educational and health outcomes, and stimulate innovation. Frontier technologies such as artificial intelligence could unlock rapid urbanization while enhancing efficiency across most areas of human activity. Analysis of big data through artificial intelligence, for instance, can mimic, simulate, and predict human and natural patterns, and reduce congestion and improve access to essential services, among other positive outcomes (Tecuci, 2012).

The "smart cities" concept has gained traction. The OECD defines smart cities as effectively leveraging digitalization to boost citizen well-being, and deliver more efficient, sustainable and inclusive urban services and environments as part of a collaborative, multistakeholder process (OECD, 2019b). To ensure new technology does not harm the environment, the International Telecommunication Union and the Economic Commission for Europe apply the term "smart sustainable city". This concept entails promoting ICT and other means to improve the quality of life, the efficiency of urban operation and services, and competitiveness, while ensuring that the city meets the needs of present and future generations with respect to economic, social, environmental and cultural aspects. Smart city technologies have unrealized potential to improve urban life, although many smart applications are already in use in security and health care, among other examples.

While urbanization accelerates digital technologies (box 4.2), there is a need to tread carefully. How much data collection is too much? Where do data mining companies cross the line and infringe on people's privacy? Creating boundaries for data respects privacy and is upheld by national legislation in some countries. Another concern relates to security breaches in security agencies, power grids, nuclear plants and financial institutions. More regulatory measures are needed on the ethical use of big data and digital technologies.

SPATIAL DIMENSIONS OF POVERTY, FOOD INSECURITY, INEQUALITY AND EXCLUSION

Urban poverty is a multidimensional phenomenon characterized by low income levels and limited access to justice, housing, water, sanitation, education and health services. It is marked by high levels of hunger and malnutrition. Housing is a key dimension, with the urban poor spending upwards of 50 per cent of their income on housing, significantly more than the 30 per cent global average. They also pay higher unit costs for water and other basic services from informal service providers. In Kenya, poor urban households paid two to

BOX 4.2 HOW TECHNOLOGY IS TRANSFORMING CITIES

The impact of artificial intelligence on urban transport

Artificial intelligence is changing how we interact with our world and solve everyday problems. In urban transport, it enhances road safety, reliability and predictability, improves efficiency in logistics and helps cut carbon emissions.

Road safety is a major public policy issue globally. Fatalities from traffic-related accidents rose to 1.35 million in 2016 from 1.25 million in 2013 (WHO, 2018). While inadequate transport infrastructure such as poor roads is one cause of traffic fatalities, human error plays a significant role. In Europe, for example, human error contributes to 90 per cent of road fatalities, underlining the potential for autonomous vehicles powered by artificial intelligence to enhance road safety.

Such vehicles are already being used on a trial basis in China, Finland and Singapore. A good example in the United States is "Olli", a self-driving local shuttle that uses IBM Watson and the Internet of things to analyse surrounding traffic and make decisions about data collected (English, 2016). The United States-based company Tesla, in its first attempt at autonomous vehicles, found a 40 per cent reduction in accident rates when self-driving technologies were activated (Sears, 2018).

Such vehicles could have a significant impact on the environment, since transportation generates about 23 per cent of total energy-related carbon dioxide emissions. Without policies to encourage their use, emissions from transportation could double by 2050 (IPCC, 2014). Self-driving vehicles can reduce emissions in part by analysing big data to eliminate inefficient trips and increase fuel efficiency.

Impact of e-commerce and new business models

Digital platforms have provided businesses with a new, convenient and cost-effective way to do business. Driven by market shapers like Amazon, global e-commerce sales grew 13 per cent in 2017, hitting an estimated $29 trillion. The number of online shoppers also rose sharply from 1 billion in 2015 to over 1.3 billion in 2017, with no signs of declining (UNCTAD, 2019).

Online businesses have faced the charge that their concentrations of production and capital are destroying traditional brick-and-mortar shops. Across the United States, some retail companies have been unable to keep pace with the digital revolution. Five big department stores (JCPenney, Nordstrom, Kohl's, Sears and Macy's) lost a combined $75 billion in market value from 2006 to 2016 due to the so-called "Amazon effect". In the same period, Amazon's market value soared from $17.5 billion to a whopping $355.9 billion (CBInsights, 2018).

While the loss of some traditional retail stores is a concern, the digital revolution has prompted other businesses to change their models. Some now build an online presence first and create a strong customer base, and then open offline stores to establish a stronger connection with customers. E-commerce will continue to grow in the foreseeable future and will play a significant role in urban economies.

five times more per unit of water than the connected tenants in other areas (Citizen's Report Card, 2007, cited in Twaweza, 2010). Transport costs are disproportionately higher for the urban poor. In Harare, they spend almost a quarter of their incomes on transport, while in Kampala, they spend almost half (The World Bank and IMF, 2013).

Urban poverty is frequently exacerbated by a lack of food self-sufficiency and by social safety nets that are informal, fragmented and irregular. Urban livelihoods are highly dependent on monetary income, which must be predictable, yet this is rarely the case in the informal labour markets where poor households attempt to make a living. The poorest households are especially vulnerable to internal and external economic factors outside their control.

Food insecurity and malnutrition as well as obesity are serious challenges in many urban areas, especially among children. While urban populations enjoy better health on average than those in rural areas, inequalities within cities are growing. Rates of stunting among the poorest urban children, for instance, can be as high or even higher than rates among poor rural children. At the same time, the nutrition transition, which has seen shifts in consumption from traditional, often healthier foods to highly processed foods full of calories, saturated fat, sugars and salt, is happening fastest in urban areas. As a result, urban obesity rates are higher compared to rural ones, although the gap among adults is narrowing. Differences in the prevalence of young children who are overweight are quite small (FAO, 2019).

Understanding the drivers and forms of malnutrition in urban areas will be key to achieving SDG target 2.2 on eliminating all forms of malnutrition. Food system policies and interventions will not achieve desired results unless they address nutritional challenges in cities.

Food insecurity and malnutrition are often linked to poverty, and urban areas are no exception. For the poorest urban households, food security depends on cash, which typically comes from uncertain livelihoods. These render people vulnerable to financial crises or food price hikes, more so where they have little or no access to social protection. Parents and other caregivers spend more time outside the home with potential consequences for childcare and feeding practices. Lack of water, sanitation and hygiene facilities affect food security and safety as well as nutrition. In many low- and middle-income countries, a significant share of food consumed in urban areas runs through informal systems that provide employment opportunities for the poor but also carry health risks.

Income inequalities are reinforced spatially in urban areas through neighbourhoods clustered around different income, ethnic or religious groups. Theories of urban economics posit that the concentration of households by income levels, with locations determined by desirability and affordability, are some of the first causes of inequality. Before motorized transport, the costs of communication in small urban areas encouraged the concentration of residences, services and other economic activity in city centres. Individuals with higher income were more likely to secure the most desirable locations, resulting in low-income households living further away. With motorized transport, it became possible for high-income individuals to buy large tracts of land on the city periphery while they worked at the city centre. In many cities today, the urban poor concentrate in city centres, often in neighbourhoods or informal settlements with inadequate services, while

high-income individuals living on the city periphery enjoy full amenities (Kilroy, 2009).

Spatial inequality in urban areas reinforces discrimination, exclusion and stigma when populations are segregated by ethnicity, race and/or religion. Migrants are often clustered in communities set apart from local populations, which can exacerbate inequalities based on religion, income and ethnicity. In the Syrian conflict, for example, refugees and other migrants live apart from local communities. Kilroy (2009) notes that 32 per cent of all residents in Paris would have to be relocated to achieve an equal mix of French, Maghreb and African populations. Gobillon, Selod, and Zenou (2007) note that income inequality in China's cities is increasing, with the Gini coefficient rising from 0.16 in 1985 to 0.32 in 2003. Yu and Xiang (2014) showed that income inequality in China between 2005 and 2014 sharply increased, with the Gini coefficient reaching 0.53 to 0.55.

While wealth in cities is concentrated unequally around economic clusters, cities also present an unprecedented opportunity to tackle poverty, as engines of economic growth and the location of 70 per cent of the world's population by 2050. With proper urban planning, economic systems can be remodeled to ease the entry of impoverished and inadequately skilled people into employment and viable entrepreneurial activities. Cities that invest in public spaces, adopt mixed-use planning methods, and involve low-income households in municipal planning and budgeting significantly reduce spatial inequality (UN-Habitat, 2020a).

Recommendations and policy responses

Many policy implications stem from urbanization patterns, their relevance to sustainable development and links with other megatrends. Seven policy recommendations follow, geared towards helping countries harness urbanization and effectively manage urban population growth. Directed primarily towards national and local governments, the recommendations may also be useful to private and non-state actors promoting sustainable urbanization. While they are potentially useful in all countries, local conditions and historical contexts will determine how they are formulated and applied.

NATIONAL URBAN POLICIES

National urban policies provide a framework for guiding the social, environmental and economic opportunities of sustainable urbanization (UN-Habitat 2020b; New Urban Agenda, 2016). The New Urban Agenda in 2016 highlighted the central importance of such policies in aligning geospatial planning, financing sustainable development, creating industrial policies and environmental planning. Rather than confine policymaking to cities, national urban policies provide a view of spatially balanced development across rural areas, peri-urban areas, small towns in predominantly rural subregions, small and intermediate cities, and large metropolitan areas. They help countries prioritize investments in infrastructure and ICT that connect cities, and link rural and urban areas to strengthen supply chains. They may support a transition from sectoral policies to a systems approach by integrating policies on housing, food security, transportation, homelessness and the environment, among other issues. Some key considerations follow.

Integration of urban, peri-urban and rural areas: National urban policies should be comprehensive. One national framework should integrate large cities, rural areas, small towns and peri-urban areas, as well as infrastructure connecting networks of cities, and rural and urban areas. Policies need to anticipate changes in the urban landscape as administrative boundaries expand, with rural areas reclassified as urban ones and forming peri-urban areas.

Small and intermediate cities*:* National urban policies should offer detailed strategies for agglomerations with populations of 100,000 to 500,000 people. Small and intermediate cities in the Global North have ageing infrastructure and struggle to transition to post-industrial production processes. In Africa and Asia, these cities are among the fastest growing in the world. In both cases, they are crucial for economic transformation, but require investments in planning and technology. In particular, they constitute strategic markets for rural agriculture, and can serve as hubs for food-processing industries and services.

Integration of global goals and agreements*:* National policy frameworks should reflect the 2030 Agenda, the New Urban Agenda and other intergovernmental agreements, as well as global policies advanced by the United Nations Habitat Assembly. Commitments by United Nations Member States to implement global agreements and policies carry the advantages of harmonization, accountability and monitoring, and create conditions for comparable cross-country data on urbanization.

Multistakeholder frameworks*:* Developing national urban policies is as important as the outcome. Institutionalized consultation among different levels and departments of government, the private sector, civic organizations and citizens will ensure policies reflect the needs and contributions of diverse constituencies. It will also strengthen implementation.

National and local capacity-building: Instituting national urban policies involves data gathering, technical analysis, planning, financing, and monitoring, evaluation, and reporting measures. Successfully managing urbanization will require a central institution to coordinate interventions, a sustainable funding plan, and frequent strengthening of human capacities in national and local teams. The last could build on cross-country peer-to-peer learning.

NATIONAL DEVELOPMENT AND ECONOMIC PLANNING

National development and economic planning should apply an urban lens to establish growth strategies that prioritize resource allocations across economic sectors, programmes and investments. This would enable the acceleration of structural transformation that unlocks the potential of cities and urban systems as drivers of sustainable and inclusive growth.

Targeting economic sectors that leverage urban potential: Economic planning should target agricultural, industrial and service sectors that can leverage the economic potential of urbanization to create high-productivity jobs and grow domestic production. This process can take advantage of rising urban demand and consumption fuelled by urban population growth and the associated rise in average incomes.

Productive cities: How cities are planned and managed in part determines their productivity. To prioritize urban investments in the national development plan, governments

should consider social, economic and environmental co-benefits, contributions to job growth, potential productivity increases in priority economic sectors, and the prevention of premature constraints on urban productivity.

Balanced territorial economic planning: As custodians of national development and economic planning, governments should balance development across subnational areas. Economic planning guided by spatial considerations can help build a system of diverse, specialized cities with complementary economic functions, linked by infrastructure investments that foster city networks, and connect cities to small towns and rural areas.

Targeted investment: To implement economic policies based on integrated spatial planning, governments will need to make targeted investments, such as in investment incentives and special economic zones. This will help ensure that policy innovation results in structural changes leading to modern, highly productive economic activities.[9]

URBAN ECONOMY AND FINANCE

To advance sustainable urban development, national governments need to support cities to mobilize finance, bolster local economic development and invest in infrastructure. National governments should delegate fiscal authority to subnational governments to reduce reliance on intergovernmental transfers and empower local governments to derive endogenous sources of revenue. Both levels of government should create incentives for local industry to generate employment for burgeoning youth populations, encourage local entrepreneurship and increase access to credit. National governments and municipal authorities also need to coordinate investments in urban transportation that combines public with non-motorized transport, and in water and sewerage systems, renewable energy sources and public spaces.

Strengthened financial and administrative decentralization: Countries can decentralize public administration to provide local and regional governments with the fiscal autonomy to collect local revenues. This can help finance effective and cost-efficient service delivery, and support much-needed investments in affordable housing and sustainable infrastructure. Much depends on local capacity, which may need to be enhanced.

Innovation in local revenue generation: Policies should promote and support local governments in using innovative approaches to boost city revenues and investments. Financing mechanisms such as municipal bonds, climate financing, blended financing, etc. can be strengthened, as well as medium- and long-term policies related to creditworthiness, investment de-risking and debt sustainability.

Strengthened land-based financing: Property taxes are one of the main revenue sources for local governments but are underused in many developing countries. National urban policies should detail alternative land-based financing instruments, with a focus on peri-urban areas. Tools such as developer exactions, sales of development rights, tax increment financing, and other forms of land value capture should be encouraged and institutionalized.

9 For example, given resource and management capacity constraints, African countries may need to prioritize a few locations for investment, including their largest cities and metropolitan urban areas, in order to reap agglomeration economies, while simultaneously building transport networks linking these with strategically located secondary cities and growth centres.

***Local employment generation**:* As urban populations grow, the availability of employment in manufacturing and tradeable services is critical, as otherwise, informal low-wage sectors become default employers. National economic policies as well as urban and peri-urban policies and investments, both domestic and foreign, need to create mechanisms to harness the productive power of urban populations. Policies should promote entrepreneurship and tap latent and underused talent in the informal sector, including through start-up incubation hubs and access to credit for individuals at different levels of education and income.

INDUSTRIAL POLICIES TO ENHANCE URBAN PRODUCTIVITY

Urbanization and industrialization are complementary. Cities offer prime locations for new industries, and productive advantages such as skilled labour, diverse markets, capital and easy access to other firms. Industrial development, through policies that promote structural change and expand highly productive economic activities, creates productive jobs and is a magnet for people seeking employment. Given these interconnections, local governments should translate national industrial policies into concrete plans for additional infrastructure and essential services demanded by growing populations and firms. To be effective in urban settings, industrial policies require several elements, as follows.

Incorporation of environmental, social and governance policies: Industrial development and economic growth should not be at the expense of the environment, food systems, the quality of employment, natural resource management, equality or human rights. Integrated policies should reference the importance of equal pay, lower carbon emissions by industries, gender equality, the use of clean energy, and recycling and waste disposal, among other core concerns.

Deeper integration of urban and spatial priorities: Industrial policies should integrate urban and rural spatial connections associated with sustainable urban development. They should support regional and local governments as essential providers of public goods and business-friendly environments, including favourable and accountable tax systems, and an appropriate urban layout facilitating the flow of people and goods. Industrial policies can also play a significant role in creating business clusters and promoting links among subnational governments and with the national government. To contribute on their side to these objectives, local authorities should integrate industry-specific considerations in their own planning.

New industrial revolution: Innovation policies and digital technologies are transforming the industrial landscape as more businesses move online, impacting labour markets by phasing out certain traditional jobs. To address those issues, national policies should place a premium on creating strategies that enhance the benefits of new technologies, including increased access, affordability and adoption, and at the same time creating capacity to embed innovation into policies to increase productivity allowing the reconversion of the labour force or its reassignment to new areas. Technology hubs located in special enterprise zones could drive innovation in high-tech, biotech or green-tech industries, and facilitate capacity and skills development, particularly among youth.

Policies complementing trends in global value chains: A considerable amount of global manufacturing and business is shifting towards asset-light, intangible operations, mainly driven by the digital revolution. Policies

should improve supply chains linking local firms to international production platforms.

Planning for future infrastructure and energy demands: The productive transformation needed for sustainable development will require green planning and infrastructure that most of the world's cities have not yet built. It needs to be based on renewable energy and construction technologies. As more and more people move to cities, demand will increase for affordable housing, transportation hubs, communication networks and water services. To ensure investment in new infrastructure and services that is needed to keep pace with rising demand also reduces carbon emissions and creates jobs, governments will need to adopt long-term plans for building new green infrastructure. This can be an opportunity to make cities more sustainable.

Urban development and zoning policies: To integrate industrialization and urbanization, local governments will need zoning policies that define areas for residential, industrial and commercial development, and regulations that ensure commercial zones are conveniently located around industrial areas. Zoning regulations are essential in ensuring efficient land use and inclusive spatial growth.

FOOD LOSS AND WASTE POLICIES

Governments can do more to provide public goods that improve food security and nutrition, and protect environmental sustainability, while reducing food loss and waste in rural, peri-urban and urban areas.

Renew commitment to reduce food loss and waste: Governments will need to prioritize these issues in international commitments, and recognize the need for better data to track food loss and waste, design effective policies and monitor effectiveness.

Improve knowledge management and collaboration: Dedicated national strategies could improve knowledge around food loss and waste, beef up national coordination and guide closer collaboration with international organizations.

Promote increased awareness. Countries should actively pursue increased consumer and producer consciousness of the value of reducing food loss and waste, including through household and business waste collection. This could build on national awareness-raising campaigns and education programmes.

Integrated urban management. Municipalities constitute a strategic entry point for action on food loss and waste, and an efficient channel for different levels of governments to support integrated policies and programmes.

CIRCULAR ECONOMY AND URBAN WASTE MANAGEMENT

Cities concentrate resources, capital, data and talent in ways that could contribute to and benefit from the transition to a circular economy. Governments need to develop policies that facilitate this transition. At present, the linear economy has driven cities to adopt a "take, make, waste" approach that accounts for 85 per cent of global GDP and 75 per cent of natural resource consumption. Cities also produce 50 per cent of global waste, and 60 per cent to 80 per cent of greenhouse gas emissions (Ellen Macarthur Foundation, 2020). An estimated one third of the food produced for human consumption – equivalent

to 1.3 billion tons per year – becomes waste, primarily urban waste (FAO, 2013).

The circular economy presents opportunities to change these unsustainable patterns. Governments can encourage firms and social entrepreneurs to channel urban resources, capital and talent to develop disruptive technology and models based on the principles of longevity, renewability, reuse, repair, upgrade, refurbishment, capacity-sharing and dematerialization (Esposito, Tse and Soufani, 2017).

Urban policy levers for circular economy transitions: The intrinsic complexity of urban centres means no single policy measure can achieve a complete transition to a circular economy in all cities. Broadly, however, governments should consider a combination of five initial policy areas: vision, engagement, economic incentives, urban management and regulations (Ellen MacArthur Foundation, 2019).

Responsible consumption: Cities need to raise popular awareness of the power of urban consumers to achieve sustainable urban development, such as by reducing the unprecedented amounts of waste they generate. Local governments that raise awareness and change consumer behaviour can jumpstart new patterns that lead towards a circular economy.

Recovering and valorizing organic materials: Cities should implement programmes to recover and valorize organic materials, including from wastewater and food waste. They can explore generating revenue from producing energy and compost from decayed organic material, as has been done successfully by municipalities such as Milan, Italy.

Recycling and reuse: Cities need to advance policy measures and incentives for private industry to support the collection, recycling, reuse and repurposing of used consumer items, transforming what would otherwise be solid waste into inputs to produce new goods and services.

Solid waste and resource efficiency and productivity: Embracing the circular economy depends on improving resource efficiency and productivity. All materials should be efficiently used at all stages of their life cycle (extraction, transport, manufacturing, consumption, recovery and disposal) and throughout the supply chain, in line with the waste hierarchy ranking waste and materials management options from the most to the least preferred (OECD, 2020). Material reuse strategies should encourage construction to use secondary materials, including from demolitions, and to improve energy and water efficiency in new and renovated buildings.

INCLUSIVE AND INTEGRATED URBAN PLANNING

As the global population moves towards 70 per cent urbanization by 2050, local governments everywhere will need to invest time and resources in urban planning. This is as true for rural towns and small and intermediate cities as it is for large metropolitan areas.

Inclusive planning methods: Local governments need to leave no one – and no place –behind. This calls for engaging low-income neighbourhood organizations, women, youth, people living with disabilities, socially marginalized populations, the elderly and others in urban planning processes. Inclusive planning helps cities identify the needs of underserved populations

and can be used to increase access to credit, property and markets, and provide everyone with adequate housing and affordable public services. Local governments will be able to better promote measures to ensure women, refugees and minority groups, among others, gain protection against all forms of discrimination. The participation of women, for example, can steer more successful measures to achieve urban safety.[10]

Investments in social protection: Inclusive planning should guide investments in social protection programmes that yield individual and economy-wide gains. Initiatives could include innovative insurance programmes for informal workers, and public works projects to accommodate an increasing workforce.

Integrated social and economic urban planning: Local governments need to integrate urban planning into the policies of diverse economic and social sectors. Integrated planning can support compact city patterns that generate urban land value, and transform connectivity into GDP increases and job opportunities for the urban poor. Compact city patterns can ensure efficient land use, improve access to services, support higher density population, and expand economic activity. Integrated planning can facilitate transportation services that reduce congestion and commute times, and increase social inclusion through the design of quality mixed-use areas.

Vertical integration: Urban planning should be integrated vertically at different levels of government, and policy coherence maintained across key economic sectors, including industry, agriculture, infrastructure and trade. Municipal planning should be aligned with and enhance broader regional investments, including in large-scale road infrastructure and other forms of transportation. Multi-level governance structures are crucial for improved coordination in addressing shared challenges across administrative boundaries, particularly in metropolitan areas. By using urbanization as a cross-cutting driver of development, vertical integration mechanisms of this kind can greatly enhance outcomes for cities, economies and broader societies.

Performance measurement: Cities need monitoring systems and indicator frameworks to assess performance and make course corrections, including to modify policy and redirect investments. International standards are important to apply as are globally recognized key performance indicators. These enable cities to compare progress with other cities as well as monitor their own performance. Local and regional government associations, the United Nations and other international organizations have developed international standards and indicator frameworks.[11]

Key takeaways and potential roles for the United Nations

DATA COLLECTION AND INTEGRATED POLICY SUPPORT

A rapidly urbanizing world with a growing population will impact all aspects of human lives, social, economic, technological and political.

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10 The decision by authorities in Khayelitsha, South Africa to improve municipal toilets in public spaces reduced sexual violence against women by 30 per cent (Gonsalves et al., 2015).

11 The International Telecommunications Union smart sustainable cities initiative helps cities deploy new technologies in a coordinated, sustainable manner. Its smart sustainable city maturity model provides an assessment framework for determining the pursuit of different sustainability objectives, and its environment, climate change and circular economy guidance promotes eco-friendly applications of new technologies. The C40 Cities Climate Leadership Group measures progress in an urban climate adaption framework that helps cities monitor, evaluate and report on their adaption actions. The UN-Habitat city prosperity index contains 200 indicators that cities use to track social, environmental and economic aspects of sustainable development.

Understanding the dynamics of urbanization will require collection and analysis of data cutting across issues of migration, rural and urban employment, economic sectors, foreign investment, housing statistics, transportation and mobility, to name a few issues that will drive decision-making in the future.

Governments will need to draw on intergovernmental platforms, including the United Nations Statistical Commission, to agree on functional definitions that effectively delineate rural and urban areas. They should adopt a common method for aggregating urban data to produce reliable estimates of the shares of people living in urban areas. Such definitions and methods will greatly facilitate efforts to monitor trends in urbanization, and make comparisons among and within countries over time. Further, these will be important for the international community to improve verification of SDG indicators, particularly "tier three" or new indicators for SDG 11.

The United Nations is a key stakeholder in collecting data, and is well placed to assist governments at all levels in using data to inform decision-making. Databases and platforms such as the Global Urban Observatory, the City Prosperity Index of UN-Habitat and the database of the United Nation's Statistics Division are among the resources providing data essential for policymaking. Most United Nations development system entities constitute a valuable additional resource, offering technical assistance and data support, and helping national statistics bureaus strengthen capacities. They can work as well at the subnational level, supporting municipal data collection, community-led surveys and area-based plans to provide evidence for urban investment.

Effective urban management depends on robust data collection and analysis to provide detailed descriptions of current progress and predict future trends. Innovative technology such as cloud computing, artificial intelligence and the Internet of things are crucial in this process. Yet technological progress is significantly underresourced and insufficient in many developing regions. It will be important to establish international partnerships that back increased capacities in countries with technological limitations, and invest in fundamentals such as more data centres.

Since institutional and regulatory frameworks surrounding technology remain lax around the world, governments should begin establishing them to guide national policy on technology. Partnerships with international bodies, including the International Telecommunication Union, can help harmonize global standards.

FINANCING SUSTAINABLE URBAN DEVELOPMENT AND GREEN CITIES

Constructing urban infrastructure and essential services will be imperative to meet the needs of the growing urban population. This will require huge financing flows, yet major financing gaps persist. Various estimates indicate that between $57 to $67 trillion in infrastructure spending is needed worldwide – almost 5 per cent of gross world product – every year until 2030. This amount reflects a 60 per cent increase over and above historical infrastructure spending, 75 per cent of which will be needed by cities (Kim, 2016). And the gap is only for new infrastructure. Additional amounts are needed to service and maintain ageing infrastructure that requires retrofitting and, in some cases, full replacement.

On the supply side, there are plenty of financing options, especially from the private sector. Institutional investors, such as impact investors, have increased funding for infrastructure in recent years, and international financial institutions are also becoming visible in this space. Financing, therefore, is not the problem; rather, the stumbling block is a lack of a pipeline of bankable infrastructure projects. Other issues pertain to regulatory frameworks and the capacity to promote, facilitate and manage long-term bankable infrastructure ventures. Systems of municipal tax collection, financial management and domestic capital mobilization need to be in place and reliable. The sooner this is done, the more likely the world will be able to keep pace with future infrastructure demands.

The infrastructure of the twenty-first century will make or break efforts to reduce greenhouse gases and adapt to climate change. Amid rapid growth in smaller cities, governments and private industry can maintain carbon-based models as these cities enlarge – or redirect the course by investing in green cities. Political will is crucial for upholding environmental standards in this process, such as for producing and using cement, asphalt, steel, glass and other building materials. In financing, municipal green bonds, the use of environmental criteria for credit ratings and the trend of private investment moving towards carbon neutral cities are important first steps.

The United Nations development system can help promote green cities at scale, including through mobilizing finance for the SDGs. Many of its country teams are working with governments to establish financing platforms that align public and private, international and domestic investments with key SDG targets. Conscious of the co-benefits of investments in sustainable urban development, participating investors are beginning to finance infrastructure, housing and basic services that are socially inclusive and environmentally sustainable. Mechanisms that support this process include UN-Habitat's Cities Investment Facility as well as joint initiatives with The World Bank and regional development banks.

MULTISTAKEHOLDER CONSULTATIVE MECHANISMS AND STRATEGIC PARTNERSHIPS

Consultative mechanisms bring together diverse local and non-state actors to fulfil specific and collective commitments to sustainable urbanization. The New Urban Agenda, adopted by United Nations Member States at the Third Conference on Human Settlements, in Quito, Ecuador, in 2016, sets out transformative commitments and drivers to achieve SDG 11 and urban-related targets under associated goals. Rather than confine action to governments, the New Urban Agenda calls on diverse constituencies to work with governments to promote and monitor progress.

Following the conference, a multistakeholder urban agenda platform was established to advance implementation of the Agenda. In addition to national governments, the platform brings together networks of the following constituencies: local governments, the urban poor and grass-roots women, business leaders, professionals, youth, academics and international organizations. Local governments, for example, participate through The Global Task Force for Local and Regional Governments, a network of 45 associations of cities and local governments. The urban poor and grass-roots women are represented by Slum and Shack Dwellers International; the Huairou Commission, a coalition of grass-roots women's organizations; and

Women in Informal Employment Globalizing and Organizing. United Nations entities convene on the platform under the Systemwide Strategy for Sustainable Urban Development endorsed by the Chief Executives Board in 2019. It includes 35 entities active in peacebuilding, humanitarian action and development.

The World Urban Forum, a non-legislative platform convened every two years, includes 20,000 members of the constituencies of the New Urban Agenda. At its tenth session in Abu Dhabi in February 2020, it provided opportunities for exchanges and networking, and hosted dedicated assemblies for each constituent and multistakeholder platform as well as more traditional ministerial dialogues.

In 2019, the United Nations Habitat Assembly held its inaugural session. An intergovernmental body equivalent to the World Health Assembly, it convenes ministers of local government, land, environment, housing and public works to advance global policy on sustainable urban development. All constituencies of the New Urban Agenda have observer status at the Habitat Assembly. They consult with 125 participating Member States to contribute to the formulation of global urban policy.

Andy Kelly / unsplash

Emerging and frontier technologies 5

Digital technologies are increasingly ubiquitous, affecting every part of human life. Although they first emerged after World War II, progress accelerated dramatically with the rise of the Internet in the 1990s, followed by mobile phones, among other technologies. The speed of progress has reached new highs through advances in processing power, more capable software and the convergence of various other technologies, even as costs continue to decrease (Goldfarb and Tucker, 2019).

Digital data today have become a powerful economic resource. Digital platforms are among the most influential economic agents. Robotic automation, with better sensors and motors as well as improved software, is transforming manufacturing. In finance, digital technology is extending savings, credit and insurance markets to the poor and underserved. The widespread use of new technologies during movement restrictions imposed by the COVID-19 pandemic is transforming how people work, communicate, learn, produce and consume (box 5.1).

Near-universal digitalization, transformative technological breakthroughs and rapid diffusion of technologies are unleashing structural shifts that are long term and irreversible, with far-reaching consequences. The excitement surrounding digital technologies is justified, as they offer hope for achieving the 2030 Agenda for Sustainable Development. They promise to help overcome some intractable challenges, from attaining natural resource and climate sustainability, to combating diseases and hunger, to making education accessible to all (United Nations, 2018b). Technologies can automate manual and repetitive tasks, create decent jobs, improve the quality of life and facilitate decision-making.

But some unintended negative consequences are also at work. These include sharpening digital and economic divides, unsustainable resource use and threats to social cohesion. As a megatrend, digitalization is both a tremendous opportunity for progress, and a source of new and unique concerns.

Digital technologies are transforming the world

The large-scale effects of technology are evident in the rapid pace of globalization, the transformations in labour markets, the redefinition of societal structures and many other aspects of human life (United Nations, 2018a). The rise of ever more capable artificial intelligence and automation, for instance, has combined with global value chains to generate rapid economic growth.

But the benefits of technologies are far from equally shared. One of the most visible concerns is that robots and artificial intelligence will replace human jobs on a large scale, resulting in mass unemployment or underemployment, and, consequently, widespread impoverishment. Another concern is that technology has driven declines in the wages of medium-skilled workers and their share of overall income, although it is not the only cause of the drop-off.[1]

So far, the replacement of workers by automation is mostly affecting workers in large advanced manufacturing firms. Developed countries with highly advanced national

1 A careful analysis of the link between artificial intelligence, automation, labour markets and inequality finds limited evidence to support the theory that technological progress and automation will lead to widespread unemployment. The rapidly declining cost of advanced technology embedded in tangible and intangible capital will continue to have large effects on competitiveness and production. This will have particular consequences for firms in the global value chain that are not able to keep up and remain technologically competitive. See United Nations, 2017.

BOX 5.1 HOW DATA AND DIGITAL TECHNOLOGY HELP IN THE FIGHT AGAINST COVID-19

In any disease outbreak, science and technology are important tools to gather knowledge and disseminate information to the medical community, policymakers and the public. During the SARS epidemic, the first emerging disease of the age of globalization, the Internet kept the world informed of important technical and medical breakthroughs. With the COVID-19 pandemic, technology is once again proving invaluable in monitoring and controlling the spread of the virus, and allowing economic activity to resume.

Big data and analytics generated early alerts of the new disease and informed assessments of risks. Algorithms picked up emerging patterns in Wuhan nine days before the World Health Organization officially flagged COVID-19. New data from social media streams and an increasingly dense network of connected devices are allowing machine learning systems to predict and monitor the spread of the virus.

The Internet of things also contributes useful information. In the United States, Internet-connected thermometers can track the spread of fevers in communities, acting like weather vanes in a storm. Artificial intelligence technologies analyse travel data and predict transmission risks, aiding hospitals and authorities in planning responses. Telecommunication service providers are helping governments better understand population movements in near real time to inform and assess policy interventions.

Digital technologies and mobile platforms provide important health information, track patient movements, and notify individuals of potential exposure to the virus. This vastly expands the capabilities of public health officials, who in the past relied on health workers to trace contacts and inform the public. These new tools are important for every country, complementing, but not completely substituting for, traditional contact tracing in countries with fewer resources.

The widespread availability of digital communications underpins new medical services like telemedicine, benefitting those infected with the virus as well as those needing medical advice for other reasons. The Internet has also helped many businesses maintain operations even while their workers remain at home, alleviating the economic impact of lockdowns. It has given millions a much needed social lifeline at a time when stress and anxiety are high.

An urgent call for a global framework on data privacy

While big data and digital tools are vital to fight COVID-19, their use is highlighting important questions about the role of governments in tracking individuals and the right to data privacy. One fear is that sophisticated technology and big data developed for monitoring the virus can be used for other purposes.

The data collected via contact-tracing apps and face-recognition cameras can specify the locations a person has visited, methods of transportation, goods and services purchased and social networks used, all of which reveal socioeconomic status and personal preferences. Authorities can measure body temperatures via face recognition cameras in public spaces, making it possible for them to know that a person is sick before the person realizes it. Only a few know how the surveillance is done and what it might bring in the near future. The risks underscore the need for a global framework for protecting data privacy that becomes a common standard for all people and countries.

Source: United Nations Department of Economic and Social Affairs.

innovation systems that lead research and development, and with firms and customers who can rapidly buy and use technologies, are the first to reap the rewards of new discoveries. But they are also the first to feel the consequences from technological change.

In developing countries, the impacts differ, and are highly heterogeneous. In large emerging markets with sophisticated manufacturing and service sectors, advanced technologies are beginning to compete with older methods of production. For a firm in a smaller and poorer country, however, there may not be a clear business case for investing in advanced technologies. These firms find it difficult and risky to adopt new production techniques. The lack of strong backward and forward links with global firms commanding frontier technologies further limits the speed of technology diffusion and deepens technological inequalities.

The difference in the ability to create and access frontier technologies between developed and developing countries will magnify divides among and within countries. It will widen the gap between countries that can adopt new technologies ("follower countries") and those where firms and households still struggle to access electricity, connectivity, water, sanitation and basic health technologies.

For developing countries, keeping up and catching up to countries closer to the technological frontiers depends on the ability to access new technologies. Using examples and blueprints from abroad may offer some help, but a sustained process of technological adoption depends on learning and entrepreneurship.

For exporters and importers, there are powerful incentives to innovate given competitive pressures. They can set examples, and provide knowledge and experiences influencing other firms to innovate. Governments have important roles in building infrastructure and establishing the regulatory environment, and promoting risk-taking, investment and a culture that embraces new technologies.

This chapter explores digitalization as a megatrend by first describing the conditions that drive technological progress and the main characteristics of innovation around the world. It then discusses how digitalization interacts with other megatrends, namely, demographic change, urbanization, climate change and persistent inequality, and identifies various unintended consequences. It elaborates policies to reduce the growing digital divide and mitigate the negative consequences of technologies, and concludes with a brief overview of the role of the United Nations in helping countries navigate a digital world.

Determinants and drivers of technological change

The pace of technological progress and diffusion is mostly incremental and gradual, involving improvements and adaptations of existing technology. On a few occasions, however, change has been drastic, transforming societies and economies (Freeman and Perez, 1988).[2] Regardless of its speed, technological progress depends on a regulatory environment that fosters a competitive market structure, appropriate complementary

2 The first industrial revolution was characterized by the growing use of machines to replace manual labour, particularly through the steam engine and new industrial methods in factories. The second revolution was marked by the rapid adoption of electricity and other technologies in manufacturing, and was enabled by growing transportation, communication and public health infrastructure. A third revolution came from the digitalization of electronics, which allowed information to play an increasingly transformative role in social, economic, and political life.

infrastructure (including a skilled workforce), and lower barriers to accessing knowledge and technologies that further innovation.

Regulations that promote competitive markets together with appropriate antitrust policies and an intellectual property regime strongly influence the pace of innovation. If competitive pressures are too low, firms might not be sufficiently incentivized to innovate. Too much competition could shrink profits, limiting opportunities to invest in expensive and risky research and development activities. An appropriate level of antitrust regulation ensures a level playing field for technology developers, and promotes the market entry of innovative firms. Intellectual property regulation determines the trajectory of national innovation. Excessive or insufficient protection of intellectual property discourages innovation by either constraining the flow of new knowledge and technologies or limiting returns on them.

The quality and availability of complementary infrastructure is another key determinant of innovation. This includes a dynamic financial system, appropriate technical and research facilities, responsive legal and business services, and high-quality telecommunication and transportation infrastructure. The financial system, for instance, must provide a wide array of options to meet the needs of innovators at all stages of the development process. Early on, when the risk of failure is high, private firms need access to less risk-averse financing. As innovation moves into later stages and requires more financial resources, traditional financial intermediaries such as banks and stock markets become more important.

The incentives created by competition are amplified by ease of access to technologies. For instance, the successful experiences of many East Asian economies at earlier phases of technological development, when they lacked resources and leverage other than temporary labour cost advantages, were rooted in part in accessing and adapting appropriate technologies at relatively low costs. Institutions such as public-sector laboratories and national firms were tasked with accelerating the uptake of technology by the private sector. They provided knowledge and related resources for firms to innovate in their production methods, which proved important in allowing firms to turn innovations into technological capabilities and competitive products.

Even if many of the conditions for innovation exist, rapid technological change requires constant response and adaptation by firms and governments. Technology moves too quickly, and countries that are slow to react may end up hindered by legacy infrastructure and institutions. The rising importance of data and the fast progress of artificial intelligence are good examples. Legacy information and telecommunication infrastructure cannot handle the data collection and analysis needed for artificial intelligence technologies. Data present new challenges through their growing importance across social and economic activities, where they are shifting competition dynamics and posing new regulatory challenges (box 5.2).

A technological revolution begins with a global digital divide

As different countries have progressed through various technological revolutions, the world has become divided. Today it is possible to group countries into leading and following economies, depending on their involvement in creating and using frontier digital technologies to transform production. A major concern at the onset of a new revolution is the extent to which it will

BOX 5.2 THE IMPORTANCE OF DATA FOR INNOVATION

As technology progresses, it changes the recipe for how assets – land, labour and capital – are combined to produce goods and services. New knowledge and new machines make labour and capital more efficient, and open doors to entirely new products, services, financial systems and interactions with governments. As the world becomes more digitized and interconnected, every industry in every country is affected. Information – data turned into meaning – lies at the centre of this transformation.

Firms are investing heavily in their ability to harvest and extract meaning from data and turn it into an important source of growth, complementing ideas, human labour, machines and information technology capital. Digital data are now collected from GPS trackers in vehicles and phones, social media, commercial transactions, medical information, etc. New products, services and entire businesses are forming based on data collection and analysis.

Data both result from and accelerate rapid technological progress. Genetic and medical data, weather data, financial data, location data and countless other types are being used for new scientific discoveries, technological advancements and policy interventions, and by companies to differentiate services and products.

The rising importance of data is changing the nature of competition and antitrust regulation as more innovative firms learn to make use of the data market. Many economic sectors are becoming more concentrated, which amplifies the advantages of larger firms in capturing and analysing data.

Companies must be prepared for the new competitive landscape, particularly in developing countries. Healthcare providers, manufacturers, transportation firms and many others used to compete on lower costs and better services. Now they must also learn to develop their data value chain and incorporate it into their operations.

Sources: UNCTAD, 2019b; United Nations, 2018b.

reach all countries, especially those still trying to develop basic industrial capabilities.

This section describes the main actors creating and diffusing some of the key digital technologies behind the current revolution in production. The focus is on four of these: advanced robotics, computer-aided manufacturing, additive manufacturing and machine learning.

All four have data on their patents and trade, which illuminate the extent to which different economies are engaging in global creation, production and use of these technologies. Patent data reveal levels of innovation. Export data help analyse national competitiveness in producing goods with these technologies. Import data assess the degree to which countries are using the technologies. An underlying assumption is that adoption of these technologies in countries with relatively low patent activity is mainly, if not exclusively, through imports of capital goods.

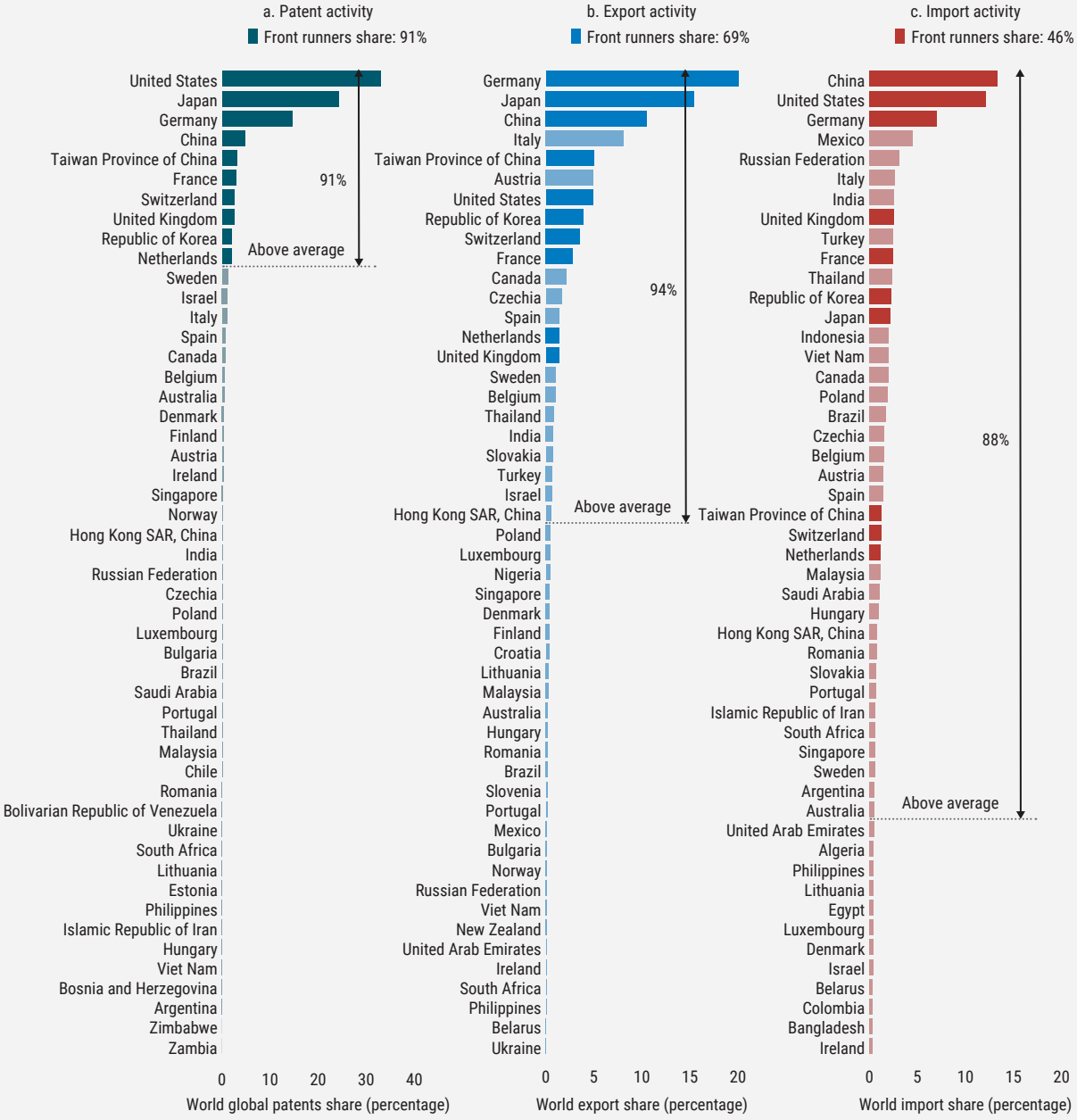
Creators, producers and users of digital technologies

Figure 5.1 provides an early glimpse of how different countries are engaging with the four technologies. It lists the top 50 economies in patents, exports and imports, ordered by their corresponding shares of world totals.

One striking feature is the extreme concentration, especially of patents and exports. In both distributions, the average is significantly high, and only a few countries are above it. These top economies account for almost all global activity in each area – above 90 per cent.

Across the world, 50 countries have at least one patent granted in these technologies. Only 10 are above the global average number of patents granted. In order, they are the United

FIGURE 5.1 PATENTING, EXPORTING AND IMPORTING ADVANCED DIGITAL PRODUCTION TECHNOLOGIES: DIFFERENT ROLES BUT SIMILAR CONCENTRATIONS AMONG THE TOP 50 COUNTRIES



Source: UNIDO, 2020.

Note: Panel a refers to the cumulative number of global patent families in the last 20 years. Global patents are defined as those simultaneously applied for in at least two of the following patent offices: the European Patent Office, the United States Patent and Trademark Office, the Japan Patent Office and/or the China National Intellectual Property Administration Office. Panels b and c refer to the average export and import values of capital goods associated with these technologies for 2014 to 2016. The figure shows only the shares of the top 50 countries, but the averages are calculated considering all countries with non-zero values in each indicator. The horizontal line in each panel separates countries above and below the average share.

States of America; Japan; Germany; China; Taiwan, Province of China; France; Switzerland; the United Kingdom; the Republic of Korea and the Netherlands. Together, they account for 91 per cent of all global patent families, clearly leading the world in creating frontier digital production technologies. All of them also have above-average shares in associated world exports and imports of capital goods (see panels b and c in figure 5.1). That is, they not only invent the new technologies, but also sell and purchase goods with them in global markets. Accounting for almost 70 per cent of global exports and 46 per cent of global imports, they are clearly the front runners.

Another group of countries are followers in the technology race. They engage in frontier digital production technologies, but are not as dominant. Israel, Italy and Sweden, for instance, have noticeable shares of global patents. Austria and Canada have important exports, while Mexico, Thailand and Turkey have relatively high imports. Looking at the average values of patent, export and import indicators once the front runners are excluded, 40 countries would fall in the follower category (Table 5.1). They hold 8 per cent of global patents and are responsible for almost half of all imports.

Taken together, only 50 countries (the front runners and followers) are actively engaging with advanced digital production technologies. They are either producing or using these technologies to an extent captured by country aggregate statistics. Another group of 29 countries is taking initial steps in these directions, with a few patents or some trade in associated goods. These countries can be regarded as latecomers. All remaining countries (88 in this characterization) have very low or no activity in advanced digital production technologies.

Figure 5.2 illustrates two salient features in the creation and use of frontier digital technologies for production. First, large parts of the world, especially on the African continent, remain completely excluded.[3] These countries are not even importing any significant volumes of the most representative goods. Second, even among countries with some activity in frontier digital production technologies, the roles are quite diverse. Latecomers, for instance, are entering the race, but it is not yet clear if they will become followers. Among the followers, a large number are mainly importing capital goods produced aboard, with very little or no domestic innovation and few exports. Their prospects to advance are limited, as this will require large investments.

Such gaps call for action by countries and the international community. Domestic policies and investments are needed to accelerate innovation and export capacities. At the same time, international support can help low-income countries to access and participate in technological breakthroughs, including to achieve the SDGs. Both domestic and international efforts should be oriented towards building basic, intermediate and advanced industrial and technological capabilities, together with digital infrastructure.

Interactions with other megatrends

The relationship between the rapid spread of digital technologies and the other four megatrends is complex and bidirectional. Demographic shifts, urbanization, climate

3 In fact, many parts of the continent, particularly rural communities, lack access to drinking water, electricity, clean cooking, sanitation and other basic necessities. It is difficult to expect any significant participation in frontier technologies when so many still lack necessities for a decent life.

TABLE 5.1 LEADING AND LAGGING COUNTRIES IN TERMS OF EMERGING TECHNOLOGIES

Group		Short Description	Criteria
Front runners (10 economies)		Top 10 leaders in the field of advanced digital production technologies	Economies with 100 or more global patent family applications in advanced digital production technologies (average value for all economies with some patent activity in this field)
Followers in production (23 economies)	As innovators	Economies actively involved in patenting in the field of advanced digital production technologies	Economies with at least 20 regular patent family applications, or 10 global patent family applications in advanced digital production technologies (average values for all economies with some patent activity, once front runners are excluded)
	As exporters	Economies actively involved in exporting goods related to advanced digital production technologies	Economies relatively specialized in exporting goods related to advanced digital production technologies that sell large volumes in world markets (above the average market share once frontrunners are excluded)
Followers in use (17 economies)	As importers	Economies actively involved in importing goods related to advanced digital production technologies	Economies relatively specialized in importing goods related to advanced digital production technologies that purchase large volumes in world markets (above the average market share once frontrunners are excluded)
Latecomers in production (16 economies)	As innovators	Economies with some patenting activity in advanced digital production technologies	Economies with at least one regular patent family application in advanced digital production technologies
	As exporters	Economies with some exporting activity of advanced digital production technologies	Economies that either show relative specialization in exporting advanced digital production technologies or sell large volumes in world markets (above the average market share once frontrunners are excluded)
Latecomers in use (13 economies)	As importers	Economies with some importing activity of goods related to advanced digital production technologies	Economies that either show relative specialization in importing goods related to advanced digital production technologies or sell large volumes in world markets (above the average market share once frontrunners are excluded)
Laggards (88 economies)		Economies showing no or very low engagement with advanced digital production technologies	All other economies not included in the previous groups

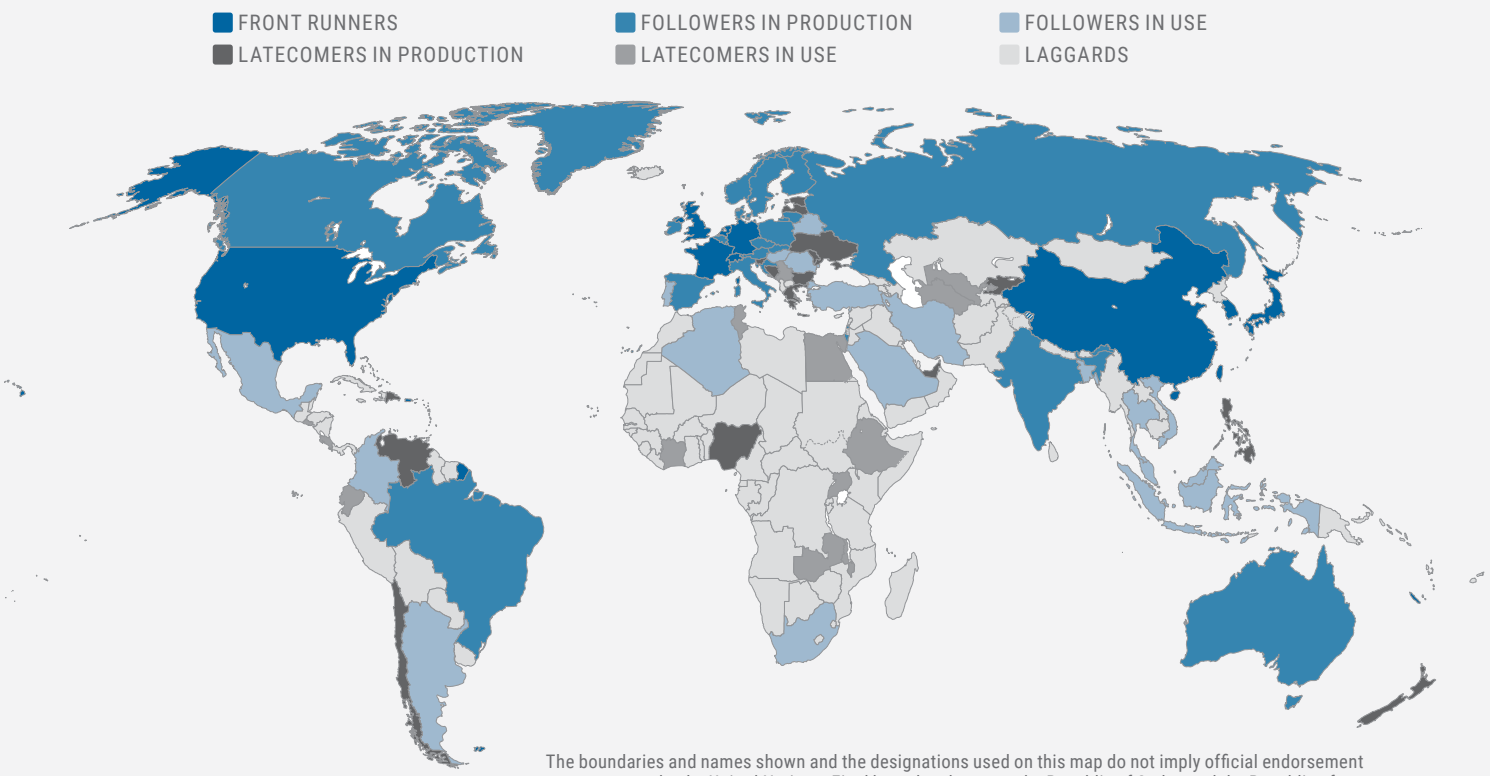
Economies actively engaging with advanced digital production technologies

Source: UNIDO, 2020.

Note: The characterization is for 167 economies, each of which, according to the United Nations Statistics Division, had more than 500,000 inhabitants in 2017.

FIGURE 5.2 LARGE PARTS OF THE WORLD ARE MISSING OUT ON TECHNOLOGY CREATION AND USE

Economies actively engaging with advanced digital production technologies



The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

Source: UNIDO, 2020.

change, and inequalities are significant drivers of technological progress, but at the same time, existing and new technologies influence the path of the other megatrends.

MEGATRENDS DRIVING FASTER INNOVATION AND THE SPREAD OF DIGITAL TECHNOLOGIES

Demographic shifts and urbanization feed the shift to a more digital world. With the number of persons aged 80 or over set to triple by 2050 (United Nations, 2019b), for example, ageing countries will face an uphill battle to maintain living standards, even as international migration from countries with younger populations, which historically alleviates demographic pressures, is less welcomed. These demographic realities are steering technologies to enhance physical and cognitive capacities, allowing older people to work longer and enjoy better quality of life. At the same time, more and better automation of agriculture, manufacturing and services can mean that some countries faced with a shrinking workforce can still produce enough to support a larger, older population.

As populations grow and age, so do demands on health systems, a major motivator of digital innovations in recent years. These are already improving health-care delivery in many countries. Mobile phones and messaging provide medical information to remote populations and as part of follow-up medical care, for example. Digital technologies also give administrators better information to efficiently manage expanding health-care services. The collection and analysis of large medical data sets can provide much-needed information for earlier, more effective interventions to improve health outcomes.

Challenges posed by climate change have increasingly spurred technological innovations. Recent advances in machine vision algorithms, for instance, now direct solar energy with enough precision to achieve the high temperatures required in carbon-intensive industrial processes. This opens the possibility for solar power, which is increasingly cost competitive, to replace fossil fuels in industries producing over a quarter of total global greenhouse gas emissions each year (Oberhaus, 2019). Given its enormity, the climate challenge will require much more innovation, including the development of net-negative emissions technologies, and increases in efficiencies in important sectors such as transport, agriculture and industry.

Rising inequalities influence who innovates and where it happens. In some communities, the lack of medical professionals has led to the launch of a new telemedicine revolution that helps make services available to millions. For the poorest countries, the potential is enormous, especially as mobile devices become even more ubiquitous and connectivity improves. A similar dynamic is at play in economic activity as more capable firms are able to respond to competitive pressures, and wealthier consumers can purchase more advanced goods and services. The fast pace of economic development in emerging economies, coupled with globalized production, have favoured a broader distribution of investment in innovation. Firms in many countries now compete for talent and resources, helping to produce and diffuse new technologies, and resulting in significant product and process innovation.

DIGITAL TECHNOLOGIES INFLUENCING THE COURSE OF OTHER MEGATRENDS

Demographic shifts

Digital technologies can help address challenges posed by two major demographic trends: ageing in many developed countries and some developing countries, and the youth bulge in some developing regions, notably Africa.

As a heterogenous group, older persons require different levels of support. While some are in good health and lead a relatively independent life, others are highly dependent on external support (Kornfeld-Matte and Hassine, 2018). Digital technologies – and their combination with other technologies – can help address a wide range of challenges among older persons.

For example, smart sensors and similar devices, such as electronic bracelets, can be used to better monitor the behaviour and health of older persons even as they travel. Assistive devices and robotics can support them in carrying out daily personal and household activities, reducing their dependence on others. Communication and memory technologies can bolster cognitive capacity and expand channels for social interaction with families, friends and the rest of the world. By carrying out tasks that caretakers find challenging to complete efficiently, robots can free them to engage more in areas

of care that require human interaction. Such technologies, among others, can provide significant support to older persons in living a life with dignity, autonomy, self-determination and non-discrimination – in other words, one that allows them to enjoy their human rights.

On the macroeconomic level, automation can help mitigate the downward pressure that an ageing population puts on investment and growth. Combined with increased opportunities for jobs in certain parts of the economy, particularly the so-called gig economy, automation can provide opportunities for ageing workers and allow countries to maintain productivity and competitiveness.

People on the other end of the age spectrum can also benefit from digital technologies. Many developing countries, notably those in Africa, are experiencing the so-called youth bulge, typically resulting from a combination of high fertility rate, a significant reduction in infant mortality and a small share of older persons. The proper use of digital technologies could help countries translate the youth bulge and its associated labour surplus into a demographic dividend.

Digital technologies can support youth in acquiring necessary education and training for participating in the labour market. For example, massive open online courses allow tens of millions of youth to access low-cost and tailored education from every corner of the world, equipping them for fast-changing labour market conditions. Communication technologies, such as the voice over Internet protocol, can be used for virtual mentoring.

Second, digital technologies can improve options for young people in advancing their careers. Sharing economy platforms have shown potential by leveraging algorithms that instantly match the demand and supply of millions of people and rating systems that make work performance publicly available. They can help those without a job history, including many young people, to build their reputation and secure higher wages through positive reviews. Online marketplaces for jobs and tasks expand employment opportunities as they connect youth with employers. Some firms post millions of jobs outsourced to workers globally.[4] Online fundraising platforms, where individuals contribute funds to a cause or the development of a product, help young aspiring entrepreneurs to mobilize resources for establishing businesses and creating their own jobs rather than waiting to be recruited for one.

Urbanization

In an urbanizing world, digital technologies can mitigate the negative effects of the often rapid growth of cities, reorienting the process in a more sound and sustainable direction. Smart digital infrastructure can help city planners and policymakers better understand and control operations, optimizing limited resources. Such infrastructure improves the ability to collect, disseminate and act on information before problems escalate (United Nations, 2016c).

A major challenge for cities is traffic congestion. Powered by digital technologies, smart traffic systems, with sensors and traffic signals to monitor, control and respond to traffic conditions, can reduce congestion by prioritizing specific traffic flows according to real-time changes (HEREmobility, n.d.). This avoids the inefficiency of traditional traffic control systems with predetermined intervals. Reduced traffic brings environmental benefits through lower air pollution.

4 Examples include Upwork in the United States, Babajob in India, mJobs in Ethiopia, 1task1job in Cameroon and Go-Jek in Indonesia.

Digital technologies have improved public services in urban and rural areas. One-stop online platforms allow easier access to a range of services and facilitate interaction with public administrations (United Nations, 2016c). The expansion of e-participation, supported by growing access to social media, allows better decision-making reflecting people's voices and preferences.

Geospatial and mapping technologies powered by artificial intelligence can help policymakers proactively understand how the urban environment affects people. Aggregated information on housing preferences, property and land markets, and the impacts of different development patterns such as urban renewal and gentrification can inform policy choices on taxation, infrastructure and public service delivery. Through remote and real-time monitoring that collects data for risk and vulnerability assessments, the Internet of things, enabled by artificial intelligence, can extend health care as well as social and financial services to marginalized population groups, although this depends on Internet access and the means to use it.

Digital technologies allowing geographic separation between workers and employers could influence the speed of urbanization. As telecommuting becomes increasingly popular, it becomes less necessary, even if only marginally, for workers to be physically present in cities to access highly rewarding employment opportunities there. This may slow urbanization, giving policymakers more room to manage it.

Practices such as telecommuting will likely have little impact on the work lives of those living in slums or informal settlements, however, or who have jobs that require physical interaction. In most countries, significant shares of people remain unconnected to digital technology (see table 4.1). In developing countries, the share is higher. São Paulo, for instance, has about twice as many unconnected people as New York. The benefits of digital technologies cannot be fully realized until connectivity is available to all.

Climate change, energy and environment

Building a sustainable economy requires deep structural changes in demand and supply. Digital technologies have helped to improve resource use efficiency in production and consumption in various sectors. For example, remote sensing technology can increase the efficiency of water use (Austin and Macauley, 2001). More accurate measurement helps governments price water more appropriately, discouraging wasteful consumption. Another use of digital technologies is in monitoring illegal resource extraction. Satellite data can track sediment discharge rates at river outlets, indicating unnatural variations in discharge patterns that result from illegal sand mining, for instance (United Nations, 2020). Digital technologies can improve recycling rates by tracking consumer products through their life cycle – from production to disposal. This has the potential to better recapture materials after consumption and bring them back to the sourcing and production ecosystem (Murphy, 2019).

Energy transition is a prime example of how technology and climate change intersect. While the greatest energy challenge is to provide electricity to the millions who don't have it, a critical element involves directing investment to sustainable energy systems. This is already taking place, based on significant price drops for solar and wind energy. Renewable energy technologies are increasingly supported by new battery technologies, and mini- and off-grid systems to handle moment-to-moment fluctuations in energy production or consumption. These technologies foster environmental sustainability as well as social and economic development.

Despite signs of progress, the energy transition has barely started in most parts of the world. Where use of renewable energy is most advanced, policy typically plays a major role. Market forces alone will not likely lead to a successful transition. Both regulation (e.g., restricting fossil fuel-based power plants) and market-based policies (such as carbon emissions trading and carbon taxes) may contribute. Because climate change is not confined to national borders, these policies need a continuing effort at the level of the United Nations, where the challenge is to keep as many countries as possible on board for the immediate future. Various artificial intelligence technologies – especially deep-learning neural networks – are now heralded as "game changers" in the transition to low-emission, high-efficiency energy systems. Technology in general but artificial intelligence in particular will have applications and impacts in almost all aspects of the global energy system, from supplies through power plants and utilities to distribution to end-user devices. The potential impact of artificial intelligence is most likely greatest on the demand/consumer side due to existing large inefficiencies in energy use.

In the next 10 years, artificial intelligence is expected to have significant impacts on energy systems through electrification and changing energy mixes in autonomous transport, smart management of intermittent renewables and the discovery of unconventional fossil resources. Indirect impacts could comprise changing income distribution and development perspectives. Several new technologies likely to play important roles in future zero-carbon energy systems include Li-air batteries, organic redox flow batteries, air-breathing aqueous sulfur flow batteries, tandem dye-sensitized photo-electrosynthesis cells and bioengineered energy conversion schemes (Roehrl, 2019). The environmental benefits from smart applications powered by artificial intelligence could be sizeable. For the United Kingdom, for example, smart heating controls in buildings could reduce carbon dioxide emissions by 1.2 to 2.3 per cent, and smart appliances by 0.1 per cent.

Artificial intelligence technologies, however, are significant energy consumers in their own right. The factors that define global energy demand and mix and corresponding emissions in the coming decade will include what happens in developing these technologies, their energy efficiency, and how rapidly and widely they are deployed.

Inequality

Technological change has significant and long-lasting distributional consequences. It has always prompted changes in the labour market, but today's digital connectivity, artificial intelligence and greater automation, among other technologies, are transforming labour markets on multiple fronts, at an unprecedented speed and intensity.

While technological advances can improve labour productivity, and create new demand and jobs,[5] artificial intelligence and robotics carry significant potential to replace both manual and cognitive work processes. Those who lose their jobs in the transition are likely to be least equipped to seize new opportunities. These workers are at risk in several ways. They have fewer transferable skills and experiences in the new economy, less

5 Those sectors more susceptible to robot use – e.g., the manufacturing of motor vehicles and other transport equipment, and electronics – have seen employment levels increase or remain stable. This suggests that automation has either allowed higher efficiency without a negative impact on labour, or that demand remains sufficient to maintain employment levels despite rising automation. See AfDB et al., 2018.

education in general, and work in declining regions and sectors with limited employment.

For the most part, computerization and digitalization have favoured more highly skilled labour, boosting wages for them. Some forms of automation are now replacing workers with medium-level skills, mostly performing routine tasks that are cognitive and manual, and follow explicit rules. A surge in low-skill service jobs is also evident in some countries. These jobs are typically manual and non-routine, and less susceptible to automation.

Precisely which jobs and tasks can be replaced will depend on many factors, including technical feasibility, the cost of automation, potential gains in productivity, quality and convenience, wage and labour-market flexibilities, behavioural factors, regulatory frameworks and overall policy directions. The magnitude and direction of impacts may vary by gender, depending on the gender distribution across occupations with different risks of automation. Job displacement could affect women more, as they tend to cluster in routine tasks. In many countries, women on average have less training on skills for new jobs generated by technological advances (UNCTAD, 2019b).

By the same token, however, in some cases, women's jobs are less vulnerable than men's,[6] and an increase in automation could conceivably narrow the gender wage gap. For example, men could be much more at risk of losing jobs to automation in Germany, mainly because it still has a large and male-dominated manufacturing sector (Dengler and Matthes, 2016).

The intersection of all of these developments has hollowed out the middle of the wage distribution, which is apparent in some European countries, the United States and some developing countries. There may be some association between automation and declining labour force participation in high-income countries, as some workers are put off by pessimistic labour market prospects.

The share of labour in national income across developed economies and in some developing economies has steadily declined. Besides reflecting the inadequacy of economic policies in sustaining labour's bargaining power and wages that keep pace with productivity increases, such a trend results from technological change (UNCTAD, 2019b).[7] As automation is inherently capital intensive, its increasing prevalence raises total return on capital and the share of capital in national income.

Another possible driver of shifting income shares entails changes in market structure induced by technological development. There is not clear consensus on which structural changes are at work, but some leading theories include the net entry of low-labour-share firms that employ productivity-augmenting frontier technologies, the rising dominance of incumbent low-labour-share firms, the reduction of labour share by dominant incumbent large firms, and the concurrent developments of market size growth and labour share fall for some firms.[8]

The rise of the digital economy has created new forms of invisible work, such as virtual/digital labour done outside an employer's

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6 Brussevich et al. (2018) estimate that the female workforce is significantly less exposed to automation than the male workforce in countries such as Finland and Poland.

7 This observation on the declining share of labour income is not universally agreed. Some studies have found that addressing certain conceptual and measurement issues could lead to significant differences in estimates of the labour share trajectory (see Cette, Koehl and Philippon, 2020; Gutierrez and Piton, 2019; Rognlie, 2015).

8 See Kehrig and Vincent (2018) for a discussion on theories behind the declining labour income share.

premises. These types of work are often precarious and blur boundaries between work and non-work, and between production and consumption. They could further hasten the decline in the labour share of income, and shift economic risks from firms to workers.

Emerging challenges posed by widespread digitalization

The ubiquity of digital technologies and their growing fusion with the physical world create inevitable challenges. Some of the concerns posed by frontier and emerging technologies cut across other megatrends such as urbanization, demographic trends and climate change. The impacts of digital technologies on markets, revenues, natural resource use and social cohesion are among the most pressing issues for policymakers and the United Nations.[9]

MARKET CONCENTRATION SKEWS DISTRIBUTION

The pervasive reach of technological advances and the rise of data as a key productive input have created tendencies for market power to concentrate, with significant distributional consequences. The network effect, or the effect that an additional user has on the value of a product to others, and the increasing returns to scale, are both salient features of the digital economy that have enabled a small number of digital platforms to dominate markets. Possessing troves of data and algorithms to process them, these platforms can engage in anticompetitive behaviours that prevent others from entering the market or competing efficiently.

The large quantity of data accumulated by incumbent firms as well as substantial, upfront and irrecoverable sunk costs associated with investment in research and development serve as barriers to entry. The collection and storage of detailed personal data by digital platforms also effectively increases consumers' switching costs, especially when it is difficult to transfer personal data across platforms. Dominant platforms can also eliminate nascent competitive threats by unfairly favouring their apps over rival ones or by outright acquisition before competitors become a substantive threat. Complex and opaque algorithms create opportunities for collusion among firms that could be difficult to detect, which illustrates immense challenges in assessing anticompetitive behaviours. Updated regulatory tools need to reflect understanding of new market realities to intervene in a timely and decisive manner.

A significant concentration of market power can have negative implications on several fronts. First, the dominance of a handful of digital platforms allows them to collect even more data, which puts them in an advantageous position to exploit its immense economic potential. Continued data accumulation means these platforms can further entrench their positions in online advertising, significantly narrowing a major source of revenue for other competitors and businesses such as traditional media companies. Both developments exacerbate inequality.

Second, less competition can degrade service quality through lower privacy protection and excessive collection of personal data, among other possibilities. With few viable alternatives, users have limited say in preventing their personal data and creative content from being

9 The discussion here draws heavily from United Nations, 2018b, among other sources.

exploited by digital platforms to generate monetary values mostly captured by the firms themselves. A third concern could be a welfare loss if consumers forego uses of new technologies as privacy degrades and technological distrust grows. Finally, dominant firms may lose incentives to innovate given little competitive pressure.

TAXATION OF THE DIGITAL ECONOMY REMAINS ELUSIVE

As digitalization transforms business models and transactions, it creates challenges for national and international taxation. Digitalization allows companies to do businesses globally without having a physical presence in each country. This creates an opening for large firms to shift their functions to a jurisdiction where there is very low or no tax, regardless of where their products are consumed. To illustrate, taxes paid abroad by Facebook represented only 2.9 per cent of profits generated outside the United States in 2017 (UNCTAD, 2019b).

The current framework for international taxation has existed for nearly a century, since the time of the League of Nations. It relies primarily on the physical presence of companies in determining corporate income tax collection.[10] Under existing rules, digital companies often have no tax liability in jurisdictions where they have users and customers, even though they benefit from a country's consumer base, infrastructure and commercial resources. What further complicates the issue are evolving types of transactions between firms and customers. Popular search engines and social media platforms engage customers not just in monetary transactions, but also in barter trade, with customers granting firms the right to collect their personal data in exchange for digital services. These firms then generate monetary returns through selling targeted advertisements without a physical presence.

Digitalization has fuelled the growth of hard-to-price intangible goods and services, such as trademarked brands or copyrighted software. This complicates the monitoring of transfer pricing, where value created in one country is shifted to another country with low or no tax liability. Profit-shifting and tax base erosion deprive countries of financial resources that could otherwise fund sustainable development.

A related challenge is how to appropriately characterize income generated from providing digital access to goods or services. For example, cloud transactions, through which customers obtain on-demand network access to computer hardware, digital content and/or other similar resources, can be identified as different types of income. In the United States, the tax authority has proposed that such transactions could be classified as either the provision of services or a lease of property, depending on a range of factors, including the level of control of the property by both sides (Grant Thornton, 2019).

The complexity of these issues and the rules designed to address them can make it difficult for countries to effectively apply and enforce tax norms on multinational enterprises. This problem is particularly acute for low-capacity tax administrations.

RISING ENERGY DEMAND FROM USING TECHNOLOGY

Digital technologies hold great potential for creating environmental benefits, but are also rapidly emerging as important drivers of overall

10 See Falcão (2018) for more discussion.

energy demand and environmental pollution.[11] Box 5.3 illustrates energy use for various components of the Internet. Consumer devices account for roughly half the energy consumed. Producing these devices and other ICT components also takes up a high share of the energy production footprint. The short product life cycle of electronic products such as smartphones and computers is responsible for the massive amount of electronic and electrical waste that the world produces every year, currently reaching as much as 50 million tonnes. That weighs more than all the commercial aircraft ever built. Only 20 per cent of e-waste is formally recycled (UNEP, 2019).

Online video streaming has had a noticeable impact on carbon emissions, as a significant level of electricity is needed to sustain associated data flows. Globally, video streaming accounts for annual carbon emissions equivalent to those of Spain (Efoui-Hess, 2019). Much of this is due to mobile data use, a component expected to rise rapidly with the deployment of 5G networks.

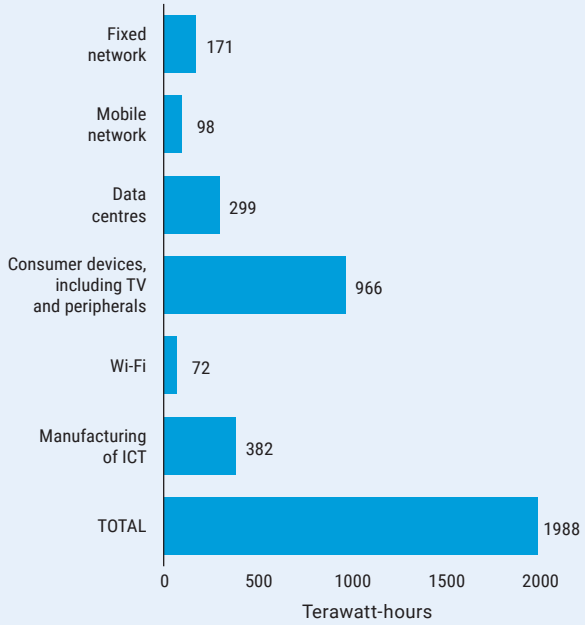
Looking towards the next 10 years, artificial intelligence and especially deep learning neural networks are expected to significantly ramp up energy demand and emissions. Already in 2019, training every single state-of-the-art deep

BOX 5.3 THE INTERNET'S HUNGER FOR ENERGY

The Internet has become truly pervasive. By June 2020, the world had 4.6 billion Internet users, 2.5 billion Facebook users, 1.8 billion websites and 362 million active Twitter users. How much energy did this take? The entire global Internet in 2020 absorbed an estimated 1,988 terawatt-hours (figure 5.3). For comparison, the world as a whole consumed over 23,000 terawatt-hours of electricity in 2017.

Roughly half of total electricity used by the Internet was due to consumer devices such as computers, mobile phones, laptops and TVs. The remainder was due to local, fixed and mobile networks, data centres and manufacturing of various components.

Figure 5.3 Estimated electricity use by the entire Internet in 2020, in terawatt-hours



Sources: Andrae, 2019; IEA, 2019; Internetlivetstats.com.

11 For a recent literature review and expert survey, see Roehrl, 2019.

learning neural network required an estimated 656 megawatt-hours of energy producing 313 metric tons of emissions, about as much as five passenger cars emit over their entire lifetimes (Strubell, Ganesh and McCallum, 2019). The algorithms used soak up vast amounts of data stored in data centres. Bottom-up estimates for data centres' energy use in 2030 range from a fivefold increase (from 200 to 1,000 terawatt-hours) to a 14-fold increase (to roughly 4,900 terawatt-hours). Much if not most of this increase will be due to artificial intelligence applications. A recent survey found that a majority of experts and scenario analysts expect increasing global energy demand over and above current trends until 2030 (Roehrl, 2019).

IMPACTS ON PRIVACY, PEACE AND SECURITY, AND SOCIAL NORMS AND VALUES

While bringing great convenience to users, digital technologies also raise a wide array of ethical issues related to fairness, privacy, and changes in social norms and values, with implications for digital governance.

Social media and other online platforms have greatly changed social interactions and the spread of information. While carrying great promise in connecting people worldwide, social media have also moulded isolated digital communities, where people largely interact with others sharing similar views. This has arguably widened societal divides, as different groups live in their own "echo chambers" and reinforce confirmation biases. The echo chambers have undermined objective expertise and spread misinformation.

Social media and other profit-driven online platforms further this spread by favouring content that draws users' attention and maximizes engagement, regardless of accuracy. Often, such misinformation includes "deep fake" videos and audio, products of advances in deep learning that can easily pass for authentic content. Algorithms employed by social media and other digital reforms – trained using data based on previous behaviours – might reinforce biases against certain disadvantaged groups, exacerbating social inequalities.

All digital platforms collect massive amounts of data for their own use and to share with third parties, with ramifications for privacy. Without proper data protections, individuals are susceptible to invasive surveillance by firms and governments. Personal data could also be used to exert undue influence on individuals' economic, social and environmental behaviours and civic participation, to the possible detriment of a well-functioning society.

The digital age creates new challenges for peace and security. The centrality of digital technologies to public infrastructure, utilities and defence systems has made them vulnerable to cyberattacks that can essentially be detected only once they occur. Digitalization of national defence means that critical decisions affecting many lives could be made by algorithms rather than human beings.

Cybersecurity is relevant as well among individuals and businesses, since both are susceptible to cybercrimes, such as through data breaches and identity thefts. Another security challenge comes from 3D printing, which "turns the digital into the physical". As 3D printing becomes increasingly prevalent, it makes weapons for criminal and terrorist activities more readily available, even as their marking and tracing become more difficult.

Recommendations and policy responses

FOSTERING THE PROS AND COUNTERING THE CONS

Growing opportunities from digital technologies run in parallel to unintended consequences. Digital dividends coexist with digital divides. Policies must therefore deliberately establish foundations for inclusion and sustainability in this new world. Yet as technological change accelerates, mechanisms for cooperation and governance have failed to keep up. Divergent approaches and ad hoc responses threaten to fragment the interconnectedness that defines the digital age, leading to competing standards and approaches, lessening trust and discouraging cooperation.

To secure a digital future for the many, rather than the few, domestic and international policies should go beyond simply enlisting more developing country users and consumers in the digital economy. They should enable greater domestic capabilities to create and capture value (UNCTAD, 2019b), since that is the only way digitalization can fully support the 2030 Agenda for Sustainable Development. The challenge is huge. Harnessing digital dividends will involve the adaptation and adoption of policies, laws and regulations in many areas, including innovation, financing, connectivity, competition, governance of development and use of technologies. While some issues can be addressed through national policies, others depend on regional and international collaboration.

Through promoting equitable access to technologies to advance sustainable development on multiple fronts, the following policies could exert a particularly powerful influence, closing development gaps among and within countries, while addressing global challenges affecting all of humanity.

POLICIES AND STRATEGIES TO CLOSE THE DIGITAL DIVIDE AMONG AND WITHIN COUNTRIES

Innovation policy

Building effective innovation systems in developing countries is crucial for them to catch up to the global technological frontier, and for making technologies more accessible to all communities within countries. Such systems require cultivating capabilities and connections among key actors, strengthening regulatory and policy frameworks, building institutions and governance systems, supporting entrepreneurial ecosystems, and facilitating access to finance and human capital. Science, technology and innovation policies need to pivot to address the three pillars of sustainable development and be fully integrated into national development strategies. Such policies should be well aligned with those for industry, the macroeconomy, foreign direct investment, trade, education and competition.

Financing policies

Overcoming yawning gaps in innovation financing is a key priority. One important consideration is avoiding an excessive focus on financing research alone, particularly for countries at early stages of development. Applied research, design and product development often also require funding. Investment in the adoption of new technologies calls for attention, as do technology extension services and training oriented towards incremental productivity improvements in small and medium enterprises.

Different instruments may be better suited to different stages of innovation and firm development, and varying national contexts. This calls for a mix of instruments, rather than reliance on any single policy measure. Innovative financing mechanisms, such as innovation and technology funds, new types of bonds and crowdfunding, can help to channel funding towards innovation, as can policies to promote venture capital, business angel finance and impact investment. International development funding has a role in supporting steps to unlock innovation, particularly in the least developed countries.

The "valley of death" in financing early-stage innovation is a universal challenge, and even innovative financing mechanisms carry risks. The expectation of a high failure rate in pursuing innovations must be built in such mechanisms. Otherwise, excessive risk aversion in financing decisions will merely replicate the shortcomings of traditional financial institutions.

In all countries, a good practice is to ensure the additionality of public investment in innovation, so that it crowds in rather than crowds out private investment spending. Harnessing private-sector expertise and promoting financing for promising new and high-growth firms are possible approaches. It may be appropriate to target innovation by both small and medium-sized enterprises and large firms, particularly in the use of tax incentives for research and development.

Entrepreneurial policy

Boosting entrepreneurship in the digital world can accelerate more as well as more equitable value creation in the digital economy (ibid.).

Low levels of e-trade readiness,[12] however, leave entrepreneurs in many developing countries facing steep barriers to scaling up their activities, including the fact that global digital competitors are often already well established. Servicing local markets digitally may require setting up blended digital and analog processes to build a user base or create a unique value proposition. Without these, digital platforms in developing countries are often unable to become physical-asset-light in the same way as their counterparts in developed countries. They need to apply different business models.

Indirect, long-term and non-traditional approaches may be needed, drawing on iterative policy experimentation and evaluation. Towards that end, governments may support the creation of in-country regional innovation platforms and ecosystems. In fragmented technological landscapes, such as those found in many developing countries, digital innovation cannot realize the potential that comes from greater inclusion and opportunities for technologies to build on each other. The challenge is to identify innovation paths with long-term prospects and work towards providing a shared, open and enabling digital infrastructure.

Digital connectivity policies

Building digital infrastructure is a complex task that requires coordination among many stakeholders: governments, international organizations, communications service providers, makers of hardware and software, providers of digital services and content, civil society, and various groups that oversee protocols and standards for digital networks. Inherent to their cooperation

12 See the UNCTAD Rapid eTrade Readiness Assessment of Least Developed Countries (eT Ready), available at https://unctad.org/en/Pages/Publications/E-Trade-Readiness-Assessment.aspx.

should be an emphasis on addressing the complex social, cultural and economic factors that marginalize many groups.

Some countries have set targets that treat Internet connectivity as a national priority. While finance alone will not achieve universal access, it can help if invested wisely. Fees on existing network providers can help expand systems to those who are currently uncovered, for example, through universal service funds.

Policymakers should recognize that investments in digital infrastructure are never one-off (Reiter, 2017). Communications networks, for example, face extremely rapid capital depreciation, at a pace almost three times faster than that of other utilities. Data-driven economies demand continuous cycles of investment. Each new technology cycle brings requirements for capital for new infrastructure, for new spectrum licenses and for new services, which would often only be fully met by contributions from both public and private sectors.

Private investments in infrastructure projects should therefore be encouraged. Such investments need to be geared towards contributing to sustainable development and incorporate sustainability dimensions, emphasizing low-carbon investment and resilience, and including vulnerable users. The United Nations Economic Commission for Europe has established guidance on new models of public-private partnerships aligned with the SDGs.[13] The international community has a responsibility to better understand when such mechanisms are most effective, and only promote them accordingly.

POLICIES TO MITIGATE THE NEGATIVE CONSEQUENCES OF DIGITALIZATION

ICT regulation

New technologies and new business and investment models are testing regulatory paradigms. National regulators must keep up, safeguarding and protecting consumers and infrastructure without hampering innovation or investment.

One regulatory model hardly fits all, and divergent regulatory frameworks for complex and fast-moving technologies may add complexity, create uncertainty, and discourage investment and innovation. Given the far-reaching impact of the digital economy, a national ICT regulatory authority should work with the competition authority, the consumer and data protection authority, the broadcasting authority and any other authority dealing with Internet-related issues. ICT regulators should also increasingly team up with regulators in other sectors to address regulation for digital transformation.

Digitalization and data policies

Securing and maximizing value from the digital economy requires not just strengthening the digital sector itself, but enabling enterprises in all sectors to take more advantage of digital technologies (UNCTAD, 2019b). Firms that invest in and apply ICTs are generally in a better position to increase productivity, competitiveness and profitability. With higher levels of digitalization in many industries (including agriculture and tourism), there is also

13 See the public-private partnership page of the United Nations Economic Commission for Europe for access to this guidance: www.unece.org/cicppp/public-private-partnerships-ppp/standards/pppstandards/documents.html.

considerable scope for digital entrepreneurs to help develop innovative digital solutions.

Countries with limited capacity to transform digital data into digital intelligence are constrained in their potential to capture economic value from data. To prevent dependence on a small group of advanced countries in the increasingly data-driven economy, national development strategies need to include digital upgrading (value addition) in data value chains. This would enhance domestic capacities to move from treating data as raw material to processing digital data and using artificial intelligence. It may involve designing national data policies and strategies to seize opportunities that the expansion of data can create, and manage associated risks and challenges.

For developing countries, key policy priorities include protecting the rights of individuals, fostering open-data policies, creating standards for the interoperability of data functions and advancing skills relevant for the data economy.[14] Governments should also address existing and emerging barriers to the growth of domestic data markets, and help firms develop strategies to extract and exploit their data. Other priorities include addressing the growing market concentration and dominance of some platforms in the data economy, enhancing consumer protection and managing cross-border data flows. As economic activities shift to the digital space, protection and privacy standards for personal data will largely determine the cost of data and the comparative advantages of developing countries in product markets (Cheng, LaFleur and Rashid, 2019).

Labour market and social protection policies

The disruptive effects of rapid technological change impose social costs, particularly on labour markets, that must be managed over the short and medium term. The implications of frontier technologies on society are still uncertain, but providing a safety net for those who may be adversely affected lowers risks, and encourages innovation and creativity. Countries could learn from ongoing experimentation with universal basic income programmes, and the potential for applying these in future social protection initiatives. Policies should encourage lifelong learning for skills updating and upgrading.

Competition policy

Digitalization complicates the assessment of competition in a market and challenges existing policy approaches. Features of digital platforms like multisided markets, non-monetary prices for consumers, or rapid price fluctuations and personalized pricing facilitated by algorithms make it difficult to understand the level of competitiveness and whether a firm is engaged in anticompetitive behaviour.

A better strategy for evaluating firm behaviour is to consider competitive relationships and strategies across markets, entry barriers, conflicts of interest, the emergence of gatekeepers and bottlenecks, the use and control of data, and the dynamics of bargaining power. The wide-reaching influence of digital technologies on people's lives has led to calls for a broader definition of consumer welfare in assessing the harm of insufficient competition, covering non-price factors such as quality, choice, privacy,

14 Countries should be guided by UN Human Rights Council resolution 32/L.20 on the promotion, protection and enjoyment of human rights on the Internet, passed in 2016. It "affirms that the same rights that people have offline must also be protected online".

innovation and the anticompetitive effects of the control of personal data (UNCTAD, 2019c).

Policymakers must be proactive in monitoring and regulating digital platforms, including their market behaviour. They could consider policy measures that facilitate the entry of local small and medium enterprises to markets with dominant platforms so they can reap the benefits of, and contribute to, the digital economy.[15] Merger control regimes should enable competition authorities to scrutinize the acquisition of start-ups by major platforms. Merger analysis needs to incorporate the role of data in acquiring and sustaining market power, and establishing entry barriers to new firms, thereby affecting future competition and innovation (UNCTAD, 2019a).

For many countries, especially developing ones, enforcing laws and regulations on competition is a daunting challenge where big global technology companies are involved. Even though these companies do not necessarily have a physical presence in countries where they operate, their practices affect local businesses and consumers anyway. One way to address this challenge may be to develop regional competition rules and authorities, like the COMESA[16] Competition Commission in Africa, which reviews mergers affecting the COMESA region.

Taxation in the digital economy

The current international corporate tax system is not adapted to the digital economy as there is not yet a common understanding of "value creation". This leads to a disconnect between where value is generated and where taxes are paid.

The issue of how best to tax profits from cross-border digital transactions is being widely debated. Multiple international forums – including the United Nations Committee of Experts on International Cooperation in Tax Matters, the OECD Task Force on the Digital Economy and Inclusive Framework on BEPS,[17] and the European Union – are discussing how to revise relevant international rules, but there are different views on how best to adapt to digitalization. Ideally, an international taxation system should be put in place, agreed by all countries, and recognizing the main aspects of the significant tax implications of digital businesses.

A recent report of the Inter-agency Task Force on Financing for Development summarized proposals under discussion (UN and IATF, 2019). It is not yet clear to many countries what these would mean for their tax bases. Any proposed international tax reforms must undergo thorough analysis of impacts on developing countries, with a special focus on their unique needs and capacities, as well as distributional consequences in terms of sustainable development more broadly.

Forging global collective action: the role of the United Nations

All technological advances should respect universally held standards for justice, equity, ethics and human rights. As the United Nations

15 The European Union adopted a regulation to promote fairness and transparency for business users of online intermediation services in June 2019. This regulation embodies new European rules to improve the fairness of online platforms' trading practices. It aims at creating a fair, transparent and predictable business environment for businesses and traders using online platforms, as well as providing new possibilities for resolving disputes and complaints. See Regulation (EU) 2019/1150 of the European Parliament and of the Council of 20 June 2019 on promoting fairness and transparency for business users of online intermediation services.

16 Common Market for Eastern and Southern Africa.

17 Base erosion and profit shifting.

General Assembly stated in 2013, "the same rights that people have offline must also be protected online, including the right to privacy".[18]

With its universal membership and unwavering commitment to human values, the United Nations is uniquely positioned to facilitate global dialogue among all stakeholders towards agreeing on a global compact of legal and ethical standards guiding advances in frontier technologies. This process can draw on previous work carried out by standards organizations and coalitions of stakeholders to develop comprehensive principles. It can build consensus on risks and opportunities, and the impacts of emerging technologies on core aspects of sustainable development, such as employment, wages and income distribution.

Given the current patchwork of laws, regulations, principles and guidelines across the globe, international cooperation is also imperative in developing uniform standards specifically for data governance. These should address data collection, verification, provenance, maintenance, ownership, control and security. A further element would entail universal professional ethical standards or a code of conduct for data professionals.

Many parts of the United Nations are doing important work on new and emerging technologies, in particular digital transformation. These activities have been brought together in the Interagency Task Team on Science, Technology and Innovation for the SDGs, which forms one part of the United Nations Technology Facilitation Mechanism. Other components include an online platform and the Multi-Stakeholder Forum on Science, Technology and Innovation for the SDGs. The mechanism constitutes a new model of collaborative, multistakeholder work, establishing an important link between governments and United Nations organizations, and pioneers in academia and the private sector.

The United Nations can continue to add value to digital transformation by setting standards, promoting multistakeholder initiatives on specific issues, developing the capacity of Member States, building organizational and human capacity on digital governance, developing arbitration and dispute-resolution mechanisms, and providing a space for debating values and norms.

The system has a deep knowledge of new technology trends, especially in developing countries, that needs to be expanded to inform its own actions and policies. It must extend partnerships with universities, labs, innovation incubators and private sector entities at the forefront of technological change, potentially through a discovery lab or a network between policymakers and technologists to exchange real-time information and policy insights.[19] New models of collaboration – with the United Nations playing a catalytic role – are needed given the rapid pace of change, which is already too fast for many institutions to effectively respond.

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18 Resolution 68/167.

19 Conclusions of the UN Expert Group Meeting on Rapid Technological Change, Artificial Intelligence, Automation, and Their Policy Implications for Sustainable Development Targets (Mexico City, 26 to 27 April 2018).

Dmitrii Melnikov / Alamy

Inequalities 6

PART 1.
Trends in inequality and why they matter

Inequalities persist around the world despite indications of progress. Overall, global income has risen, and the global poverty rate has fallen. The percentage of people in extreme poverty, living on less than $1.90 per day, dropped from 36 per cent in 1990 to 9 per cent in 2018. Yet such traditional measures of progress are rooted in averages. They do not tell the whole story of how gains have been distributed. The limited reach of average improvements echoes in recent popular discontent and protests around the world. People are contesting inequality and expressing a clear preference, across much of the political spectrum, for greater equality.

Inequality is a major obstacle to sustainable development. Reducing it has become a top priority for countries and international institutions, with impetus coming from the 2030 Agenda for Sustainable Development and its call to "leave no one behind". Among the Agenda's 17 SDGs, two explicitly aim to reduce inequalities: specifically, inequality within and among countries (SDG 10) and through achieving gender equality and empowerment for all women and girls (SDG 5). Of the targets under the 17 Goals, 25 per cent are geared towards reducing inequality and/or realizing women's empowerment.

Inequality is a multidimensional phenomenon. Attempts to understand and define it should consider all human capabilities, or the abilities to achieve the kinds of lives that people have reason to value, in economist Amartya Sen's definition. Inequality is also a dynamic phenomenon, both across the individual life cycle and across generations.

Estimates of the level and dynamics of inequality vary depending on how different dimensions are defined and the indicators used to assess these. Since inequality is about the dispersion of human experiences across a wide spectrum of outcomes, it is hard to summarize in a single indicator. It requires a comprehensive view of different dimensions and measurements. In addition, analysis should be forward-looking, as people's well-being depends in part on their expectations about future progress and social mobility. This chapter begins by examining inequality from several essential and complementary perspectives. Following the 2030 Agenda's framework, it describes inequality trends in income and wealth, in human development, and among different groups of people.

INEQUALITIES IN INCOME, CONSUMPTION AND WEALTH

Analysis of inequality in income or consumption draws on household surveys now conducted regularly in most countries (box 6.1). Among the different summary indices of income or consumption inequality, the Gini index, which ranges from 0 (no inequality) to 100 (maximum inequality), is the most popular, but there are others that, in general, tend to attach more relevance to one or both extremes of distribution.1 This chapter explores several indicators to assess trends in global and within-country economic inequality.

1 For example, the mean log deviation or the Theil indices give more relevance to the extremes of the distribution than the Gini index. Similarly, the Palma ratio, which compares the top decile and the bottom 40 per cent, is designed to measure relative movement of both tails.

BOX 6.1 THE COMPLEXITIES OF MEASURING INCOME INEQUALITY

Traditionally, the empirical estimation of income and consumption has been based on household surveys, which face measurement challenges, including non-response and the underestimation of certain sources of income (such as capital and self-employment income) and types of consumption (such as durable goods, infrequent purchases or luxury goods). Household surveys also underrepresent certain population groups that are hard to reach, especially at the top and bottom of the distribution. The accuracy of income measurement can be improved by integrating information reported by households with information from other sources, including data gathered by tax and social security agencies. Moreover, a growing number of household surveys designed to estimate net wealth (the value of financial and non-financial assets, discounting debts) oversample the very rich. These surveys remain rare, however, especially in developing countries.

Over time, the coverage, quality and accessibility of household surveys have improved substantially, but there are still serious problems of comparability across countries and over time. This has led to different efforts to compile available information across countries, like the Luxembourg Income Study, Eurostat, the World Bank PovcalNet, the OECD Income Distribution Database, the World Income Inequality Database of the United Nations University World Institute for Development Economics Research (UNU-WIDER) and the Commitment to Equity Institute, among others. These have different degrees of harmonization as well as geographical and time coverage.

Another source – the World Inequality Lab's database – relies on data from national accounts, household surveys and administrative data (tax records) to more precisely track changes in the income and wealth shares of people in different parts of the distribution, particularly those in the top 10 per cent, 1 per cent or 0.1 per cent. The availability of such data is expanding rapidly, but they remain limited in developing countries. Although their quality is improving, it is still questionable in many cases. In particular, the lack of transparency, high tax evasion/elusion and low formality pose challenges.

Even if data are improving rapidly, assessing the levels and trends of inequality involves value judgments. Namely, it is possible that the share of income at the bottom and top of the distribution might grow at the expense of the share at the middle, as is currently the case in many countries. One can give more relevance to the improvement of the incomes of the poor and say that inequality declined, or to the greater concentration of income at the top and conclude the opposite, that inequality increased.

If inequality is declining according to one index (an indication of generally pro-poor changes in income as evaluated by that index), this does not mean that all changes are reducing inequality. It might be the case that some poor people are doing worse or some rich people are doing better (both are inequality-enhancing changes). A summary index that is stable over time does not necessarily reflect an unchanged distribution, since it is possible that intense changes going in opposite directions cancelled each other. Different indicators shed light on varying aspects of income inequality; each has strengths and limitations, as do the sources used to compute them. Considering these issues, the analysis in this report relies on more than one indicator.

Trends in global inequality

Substantial progress has been made in assessing global income inequality in recent decades, that is, inequality among all persons in the world population regardless of the country where they live. Available data point to a decline in global income inequality since around 1990, breaking a long-term trend of increasing global inequality. Bourguignon (2015) estimated that the global Gini index may have increased from 50 in 1820 to 70 in 1990, but then declined to 62.3 in 2010. Such levels of inequality are larger than those found within almost any country, as discussed in the next section.

Despite stagnation of the global Gini, important changes have been observed in income growth and the regional composition of bottom, middle and top shares of income distribution. Between 1988 and 2008, income growth was faster among people in the middle of the distribution (the majority of the population in Asia) and at the very top (the rich everywhere) than among the world's poorest (mostly in Africa) and the upper-middle class (the majority of the population in developed countries) (Lakner and Milanovic, 2016).

Improvements at the bottom and middle of global income distribution are proportionally large but very small if measured in dollars because the initial levels of income were very low among these groups (Ravallion, 2018). Considering absolute income gains rather than gains in income growth rates, Ravallion (ibid.) shows that people at the very top of the distribution enjoyed, by far, the largest gains.[2] The distinction between relative and absolute inequality is not merely of academic interest. Perceptions that "inequality is rising" globally often refer to absolute differences. People perceive and experience absolute inequalities in their daily lives, in terms of living conditions and well-being. For "all nations and peoples" to meet the Goals and targets of the 2030 Agenda, absolute disparities in fundamental aspects of life must close.

Differences in standards of living across the world are, to a large extent, determined by the country in which people live rather than by whether they are poor or rich by national standards. Since the early 1990s, global trends to a large extent have been dominated by inequality between countries. That is, global inequality has declined due to faster real per capita income growth in emerging countries, mainly in Asia, and notably the most populous China and India, although other low-income countries, particularly in Africa, witnessed either no growth or a decline in their real per capita incomes.

Inequality within countries

Trends in inequality within countries vary greatly among country groups, and even within the same group, whether countries are classified by region, level of development or initial level of inequality.

Between 1990 and the mid-2010s, more countries experienced a decline in income inequality (68 countries), as measured by the Gini coefficient, than increases in inequality (45 countries) from the start to the end of the full period (table 6.1 and figure 6.1). A larger share of the world population lives in countries that witnessed rising inequality, however: 58 per cent compared to 26 per cent in countries with declining inequality. Inequality has remained relatively stable in the other 13

2 Atkinson and Brandolini (2010) also show that the Gini coefficient of absolute global inequality increased sharply over the twentieth century.

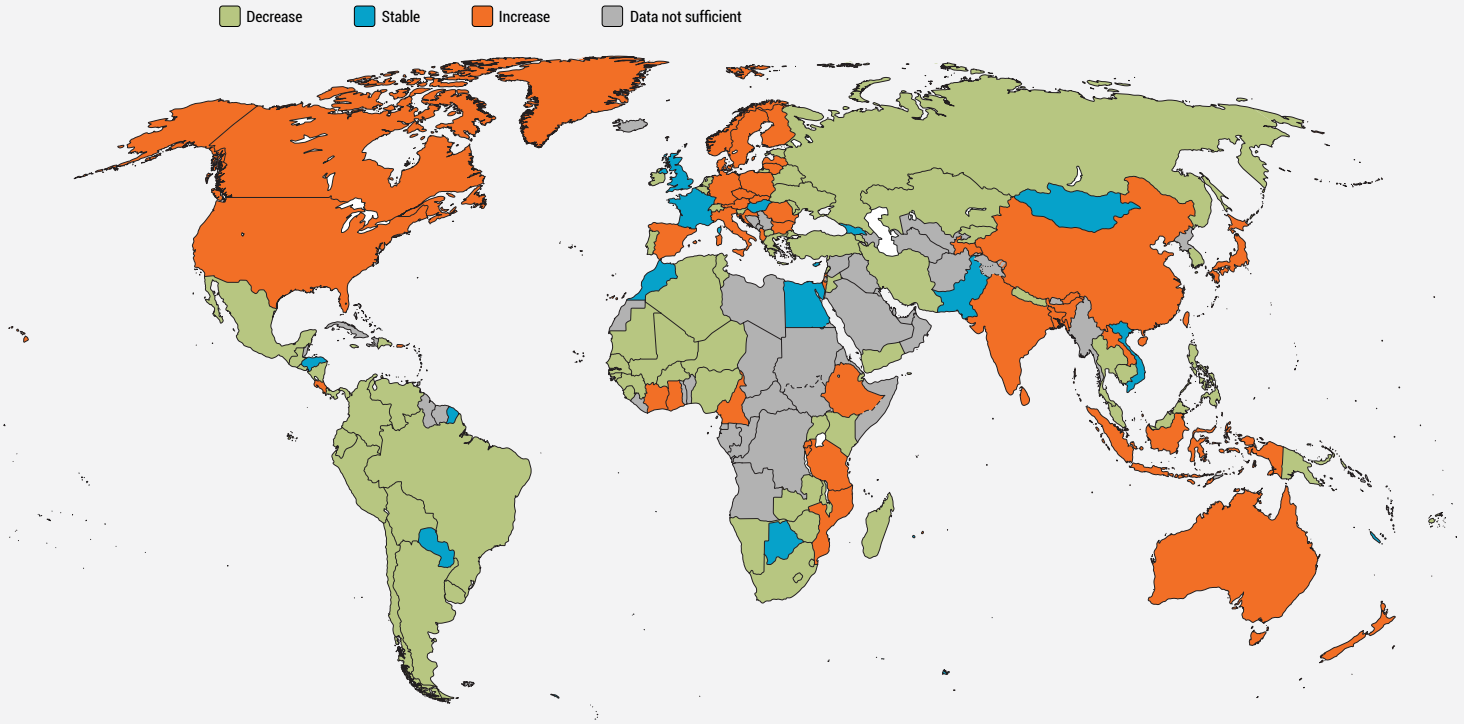
TABLE 6.1 CHANGE IN WITHIN-COUNTRY INEQUALITY (GINI INDEX) BETWEEN 1990 AND THE MID-2010S

Area		Stable	Increase	Decline	Number of countries with data	Number of countries without enough data	Total
World	Number of countries	13	45	68	126	132	258
	Population (millions)	628	4,508	2,054	7,190	605	7,795
	Population (%)	8	58	26	92	8	100
By region, number of countries							
North America		0	2	0	2	1	3
Latin America and the Caribbean the Caribbean		2	2	16	20	22	42
Europe and Central Asia		5	19	17	41	17	58
Middle East and North Africa		2	1	7	10	11	21
Sub-Saharan Africa		1	9	20	30	18	48
South Asia		1	3	1	5	3	8
East Asia and the Pacific		2	9	7	18	20	38
By income group, number of countries							
High-income		4	24	13	41	40	81
Upper-middle-income		3	8	24	35	24	59
Lower-middle-income		6	7	19	32	15	47
Low-income		0	6	12	18	13	31
By initial inequality, number of countries							
Low (<30)		3	19	3	25	–	–
Intermediate		7	19	17	43	–	–
High (≥40)		3	7	48	58	–	–

Source: Changes (more than one Gini point) in income inequality estimated using a selection of series from UNU-WIDER's World Income Inequality Database as of 17 December 2019. The classification is based on The World Bank list of 218 economies (June 2019). Population data for 2020 come from the United Nations Population Division. See Gradín (2020) for details on construction.

Note: The table covers 126 countries for which data are available, with a total population of 7.2 billion (92 per cent of the global total). Coverage is lower for the Middle East and North Africa (72 per cent and 78 per cent of the population, respectively). No ad hoc adjustment has been made to standardize indices for different concepts (e.g., income and consumption) as the focus is on trends rather than levels.

FIGURE 6.1 MAP OF WITHIN-COUNTRY INEQUALITY CHANGES BETWEEN AROUND 1990 AND THE MID-2010S, GINI INDEX



The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

Source: Changes (more than one Gini point) in income inequality estimated using a selection of series from UNU-WIDER's World Income Inequality Database as of 17 December 2019.

countries with data. As a result, the average Gini (weighted by country population) increased from 36.5 in 1990 to 38.3 in the mid-2010s.

In general, countries and regions that enjoyed relatively low levels of economic inequality in 1990 have experienced rises in the Gini coefficient. Inequality increases were the norm in many high-income countries including in North America, many European countries, Japan, and the largest Asian countries, China and India (figure 6.2). This pattern, however, presents remarkable exceptions. For example, income inequality remained constant or declined in several high-income European economies. It was stable in France and the United Kingdom, while falling in Belgium, Ireland, the Netherlands, Portugal and Switzerland. More detailed analyses for specific countries or areas help to understand national and regional inequality trends.[3]

At the same time, many countries that still suffer from high inequality have seen the Gini decline since 1990. Income inequality has decreased in

3 See, for instance, Gradín, Leibbrandt and Tarp (2020) for analysis of Brazil, China, India, Mexico and South Africa; ESCWA (2019) for Arab countries; ECLAC (2016b, 2019b) for Latin American countries; Odusola et al. (2017) for African countries; and Gornick and Jäntti (2013), Jenkins et al. (2013) and Nolan (2018) for high-income countries.

almost all countries of Latin America, but also in the Middle East and North Africa; in many countries of sub-Saharan Africa, with the exception of South Africa; and in the Russian Federation.

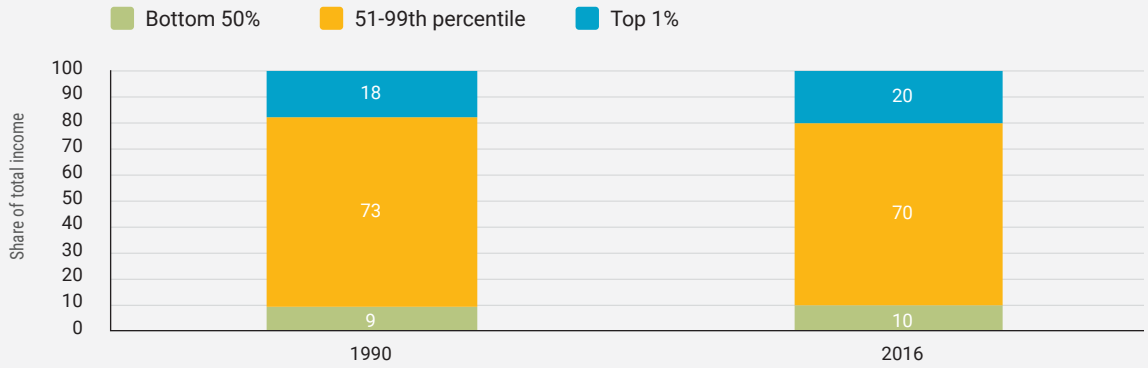
Rather than moving continuously in one direction, inequality in all regions has gone through periods of expansion and decline, when measured by the Gini coefficient. In most countries of Latin America and the Caribbean, income inequality rose during the 1990s, a decade of strong economic instability and widening wage disparities, but has declined since 2000. Starting in 2010, the pace of inequality reduction slowed, with inequality even increasing in Brazil in recent years (ECLAC, 2019b). Inequality rose in China in the 1990s and early 2000s but has fallen since 2008, as policies aimed at addressing poverty and inequality have started to take effect, and regional inequalities have subsided (Jain-Chandra et al., 2018). On average, the Gini coefficient has also levelled off in developed countries since 2008, after rising in prior decades. These declines have been small – of less than one point in most countries that have them. It is too soon to assess how the COVID-19 crisis is affecting or will affect these trends.

Trends in top income and wealth shares

One issue attracting attention in recent years is the high concentration of income and, more significantly, wealth at the top of the distribution (Piketty, 2014). This trend cannot be adequately assessed with household surveys alone due to the systematic underestimation and coverage of top incomes and assets. Capturing them requires combining data from surveys with information from a variety of other sources, including fiscal data, national accounts or rich lists (like Forbes Magazine's world billionaires list). There is high cross-country disparity in the coverage, availability, accessibility and quality of these data sources, and their use requires a complex methodology.

In its World Inequality Database, the World Inequality Lab combines household survey data with national accounts and administrative records (tax returns) to account for top incomes.

FIGURE 6.2 SHARES OF PEOPLE AT THE TOP, MIDDLE AND BOTTOM OF INCOME DISTRIBUTION, 1990 AND 2016



Source: Calculations based on data for 100 countries and areas from the World Inequality Database.

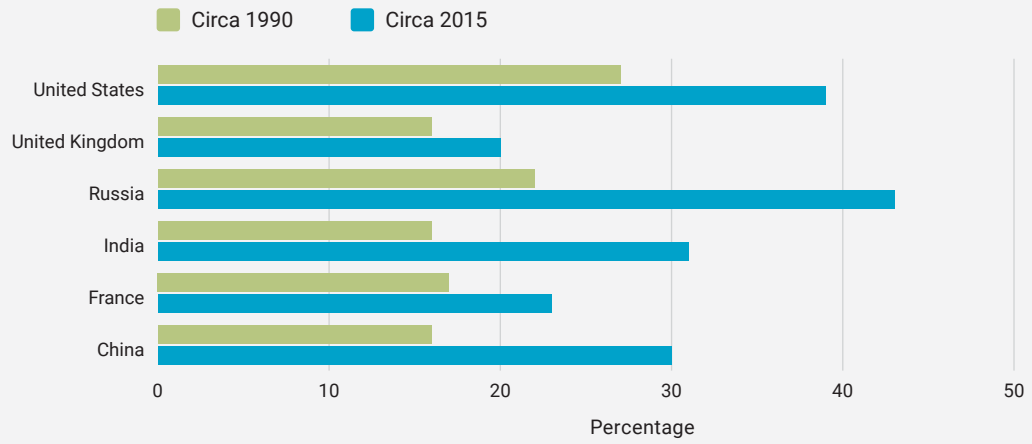
Note: Estimates are based on pre-tax national income, which is the sum of personal income flows from labour and capital before taxes and all transfers, except pensions.

The data show that income growth rates have been larger at the bottom half of the income distribution than at the upper half, except for the very top, in which growth rates were the greatest, with the Gini index remaining stable from 1990 to 2016, in contrast to the declining trend in global inequality discussed earlier.[4]

These estimates reveal that, across the world, there has been a large and increasing concentration of income among the very rich (top 1 per cent) as well as a small improvement among the bottom 50 per cent (figure 6.2). The increased economic relevance of these two groups grew at the expense of the rest of the population. Those between the 50th and 99th percentiles saw their share of global income decline from 1990 to 2016. The increasing concentration of income at the top was not homogenous across regions. It was more intense in the Russian Federation and Ukraine; Asia, excluding the Middle East; North America and Southern Africa. It was more moderate in Europe, Latin America, Oceania, and Western and Middle Africa. The share of the top 1 per cent declined only in Eastern Africa, and the Middle East and Northern Africa.[5]

Data challenges are even greater when it comes to estimating the distribution of the stock of wealth. Only a few, mainly rich, countries have household survey data allowing direct analysis of trends in wealth inequality. Relevant administrative data are also scarce. Despite these constraints, the information available shows that wealth is more unequally distributed than income.[6] The *World Inequality Report 2018* points to an increasing concentration of wealth among the top 1 per cent in the few countries with sufficient wealth information available (figure 6.3). Based on this limited evidence, the report estimated that the top 1 per cent of the world owned about 33 per cent of total wealth in 2016.

FIGURE 6.3 SHARE OF WEALTH OF THE TOP 1 PER CENT IN SELECTED COUNTRIES, 1990 AND 2015



Source: Calculations based on data from the World Inequality Database.

4 This analysis is based on pre-tax income data, considering old-age pensions as deferred income. This is different from other measures of "market income" used to compute inequality by other sources. See comparative analysis by UNDP (2019, spotlight 3.2).
5 Calculation based on data from the World Inequality Database (https://wid.world) extracted on 19 January 2020.
6 In OECD countries, on average, wealth inequality is more than twice the level of income inequality. The richest 10 per cent of the income distribution holds 24 per cent of total income, while the wealthiest 10 per cent holds 52 per cent of all net wealth (Balestra and Tonkin, 2018).

Capital and labour

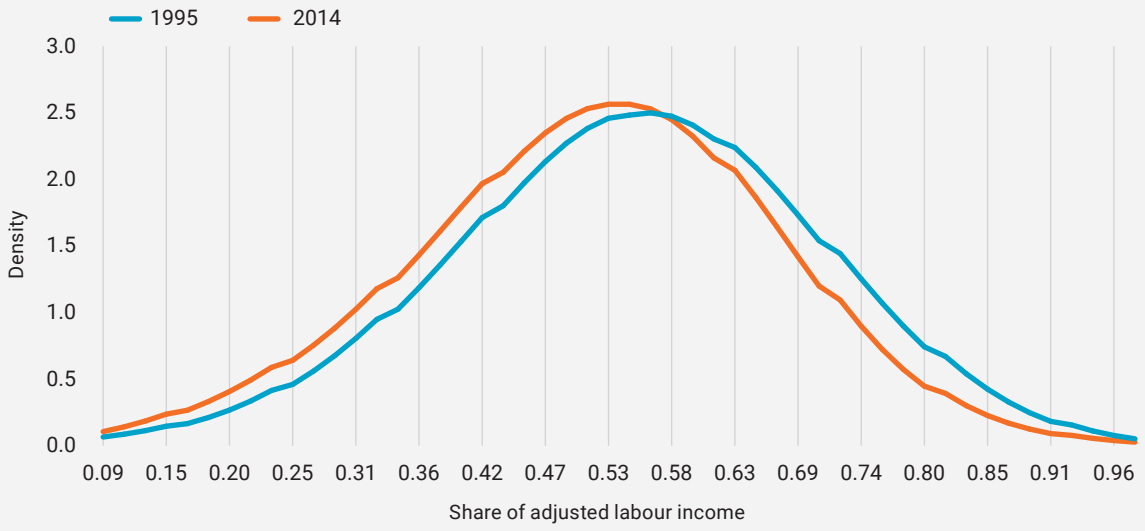
Studying the shares of different production factors in total national income helps to link incomes at the macroeconomic level, as reflected in national accounts, with incomes at the household level. It is also useful to assess the extent to which increased productivity is reflected in higher wages or earnings (Atkinson, 2009). In general, a greater labour income share of value added is associated with lower income inequality (Daudey and García-Peñalosa, 2007; García-Peñalosa and Orgiazzi, 2013).

Labour income shares have been declining since the 1980s, not just in high-income countries but in emerging economies as well. Figure 6.4 shows a decline in the labour income share from 1995 to 2014, with the median value about 2 percentage points lower in 2014. Among the 133 countries with data, the labour share declined in 91 countries, increased in 32 and remained stable in 10. These trends constitute a departure from the relative stability that had characterized this indicator since the end of World War II.

In addition to declines in the labour share of income, the wage gap between top and bottom earners has increased considerably in most developed countries and several developing countries with available data (ILO, 2016; OECD, 2015).

At the global level, the incidence of non-standard forms of employment – temporary and part-time jobs, own-account work and informal employment – has increased. Workers under non-standard contracts, particularly temporary workers and the self-employed, earn less than workers under standard contracts. The former bear the brunt of employment losses during recessions, are not afforded the same protection

FIGURE 6.4 DISTRIBUTION OF THE ADJUSTED LABOUR INCOME SHARE FOR 133 COUNTRIES, 1995 AND 2014



Source: ILO, 2016, on the basis of the Penn World Tables, available from http://cid.econ.ucdavis.edu/pwt.html. The adjusted labour income share takes into account an estimate of the labour income of self-employed workers.

Note: The figure shows the probability of countries being at a particular level of the labour income share.

as other employees and lack recognized forms of organized labour. Workers have also become more vulnerable due to a decline in the share of waged workers in the traditional "middle" of the workforce – that is, workers with middle-level skills who usually perform routine jobs, ranging from administrative services to sales-related occupations. On the other hand, top salaries have risen dramatically. A sizeable proportion of observed gains in top income shares is due to increases in top wages and salaries and other remuneration (Atkinson, Piketty and Saez, 2011). The rise in the pay of top executives has attracted considerable attention in past decade in developed countries, particularly the United States. In 2016, the compensation of chief executive officers of the top 350 companies in the United States, including salary and bonuses, was 224 times higher than the average employee's pay (Economic Policy Institute, 2018).

INEQUALITIES IN HUMAN DEVELOPMENT

The twenty-first century has witnessed great progress in living standards, with an unprecedented number of people around the world making a "great escape" from hunger, disease and poverty, and moving above a minimum level of subsistence. Though many people are still being left behind, the Human Development Index shows impressive improvement on average.[7] But inequalities are widespread across all the capabilities that underpin human development. Some capabilities, like health, define life and death. Others, such as education, determine access to knowledge and life-changing technologies.

The difference in life expectancy at birth between low- and very high human development countries is 19 years, reflecting gaps in access to health. And there are differences in expected longevity at every age. The difference in life expectancy at age 70 is almost 5 years.

There are important gaps in education among countries. In 2017, some 42 per cent of adults in low human development countries had a primary education, compared with 94 per cent in very high human development countries. Only 3.2 per cent of adults in low human development countries have a tertiary education, compared with 29 per cent in high human development countries. In access to technology, low human development countries have 67 mobile phone subscriptions per 100 inhabitants, half the number in very high human development countries. For access to broadband – an advanced technology – low human development countries have less than 1 subscription per 100 inhabitants, compared with 28 per 100 inhabitants in very high human development countries.

The furthest behind include the 736 million people still living in extreme income poverty in 2015, a figure that could rise to over 1 billion people globally as a result of the COVID-19 crisis (Sumner, Hoy and Ortiz-Juarez, 2020). When measured by the Multidimensional Poverty Index, the number jumps to 1.3 billion.[8] Some 262 million children are out of primary or secondary school, and 5.4 million

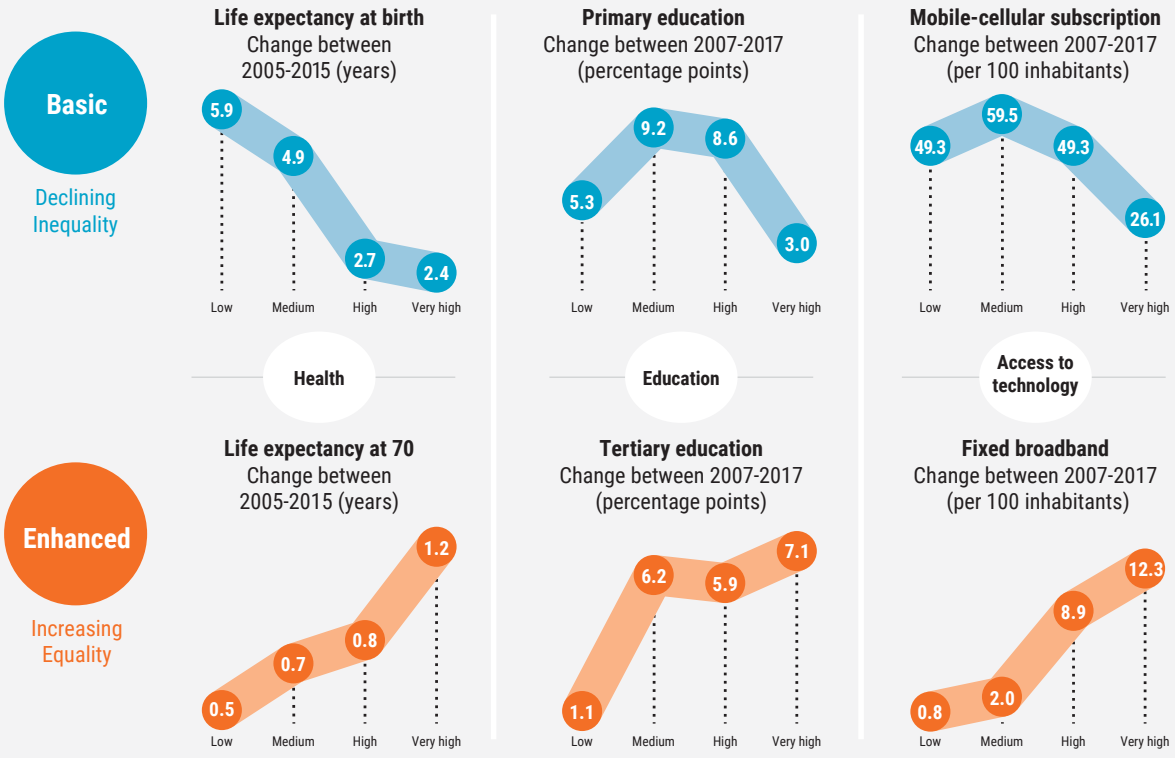
7 The Human Development Index is a summary measure of average achievement in key dimensions of human development: a long and healthy life (life expectancy at birth), being knowledgeable (years of schooling for adults aged 25 years and more and expected years of schooling for children of school entering age) and having a decent standard of living (gross national income per capita). It is calculated as the geometric mean of normalized indices for each of the three dimensions.

8 The Multidimensional Poverty Index, as calculated by the Oxford Poverty & Human Development Initiative and the United Nations Development Programme, complements traditional monetary-based poverty measures by capturing acute deprivations in 10 indicators related to health (nutrition, child mortality), education (years of schooling, school attendance) and living standards (access to improved sanitation, drinking water, cooking fuel and three different household assets).

children do not survive their first five years of life. Among the latter, 80 per cent of deaths are in the third trimester and first week after birth. Despite greater access to immunizations and affordable treatment, child mortality and perinatal mortality rates in the poorest households in the world's poorest countries remain high. The highest rates are in low and medium human development countries, but there are vast disparities within countries. The poorest 20 per cent in some middle-income countries can have the same average mortality rate as children from a typical low-income country.

Inequalities in some basic capabilities are slowly narrowing among most countries, even if much remains to be done. Life expectancy at birth, the percentage of the population with a primary education and mobile-phone subscriptions all show narrowing inequalities across human development groups (figure 6.5). People at the bottom are progressing

FIGURE 6.5 SLOW CONVERGENCE IN BASIC CAPABILITIES, RAPID DIVERGENCE IN ENHANCED ONES



Source: UNDP (2019), based on data from the International Telecommunication Union, the United Nations Educational, Scientific and Cultural Organization Institute for Statistics, and the Population Division at the United Nations Department of Economic and Social Affairs. Country groups are defined according to values in the Human Development Index in four intervals: low (0–0.55), medium (0.55–0.70), high (0.70–0.80) and very high (0.80–1.00).

faster than those at the top. The gain in life expectancy at birth between 2005 and 2015 for low human development countries was almost three times that in very high human development countries, driven by a reduction in child mortality rates in low human development countries. And countries with lower human development are catching up in access to primary education and mobile phones.

This good news comes with two caveats. First, despite progress, the world is not on track to eradicate extreme deprivations in health and education by 2030. Second, gaps are falling in part because those at the top have little space to keep moving up.

Against this backdrop, a new generation of inequalities in human development is emerging, compounding the unresolved inequalities of the 20th century. Inequalities are widening in the capabilities that will shape twenty-first century societies, pushing frontiers in health and longevity, knowledge and technology. For instance, the gain in life expectancy at age 70 from 1995 to 2015 in very high human development countries was more than twice that in low human development countries. Before the early 1990s, gains were distributed fairly equally across countries. Within countries, rising inequality in life expectancy at older ages is even more dramatic.

Divergences in access to advanced knowledge and technology are even starker. The proportion of the adult population with tertiary education is growing more than six times faster in very high human development countries than in low human development countries, and fixed broadband subscriptions are growing 15 times faster.

These new inequalities, both among and within countries,[9] are hugely consequential, for these are the capabilities that will likely determine people's ability to seize emerging opportunities, function in a knowledge economy and cope with climate change. Inequalities may help explain why data on self-reported happiness, measured as satisfaction with life overall, show increasing divergence around the world, a trend that rose sharply after 2010.[10]

GROUP-BASED INEQUALITIES

The world is far from giving all people the same opportunities to live a healthy and prosperous life. The 2030 Agenda draws attention to the fact that inequalities based on different groups of people, defined by gender, age, area of residence, race, ethnicity, origin, religion and disability, among other attributes, are common in developed and developing countries alike. This section examines group-based disparities, also referred to as horizontal inequalities, to illustrate inequality of opportunity and highlight the disadvantages faced by some social groups.

Group-based disadvantage, poverty and inequality

A sizeable part of observed income inequality can be attributed to inequality among groups, although large differences are found across countries. For instance, inequality among racial groups accounted for an estimated 50 to 70 per cent of total inequality in South Africa in the mid-2000s, and 30 to 50 per cent of the total in Guatemala, Panama and Paraguay, but less than 15 per cent of the total in developed countries (Leibbrandt, Finn

9 See UNDP (2019, chapter 1) for examples within countries.
10 The increase in inequality in subjective well-being is measured as the ratio of reported "happiness" between the top and the bottom 5 per cent, 10 per cent and 25 per cent of the population (UNDP, 2019, spotlight 1.3).

and Woolard, 2012; Elbers et al., 2005, 2008). Around 40 per cent of inequality in low- and lower-middle-income countries is due to the gap in living standards between rural and urban populations (Young, 2013; FAO, 2017, 2018b).

Trends in the two key components of inequality – across groups and within groups – do not always go hand in hand. South Africa, for instance, has seen total income inequality and inequality within groups increase rapidly since the end of apartheid, while inequality across racial groups has declined in many dimensions (Gradín, 2019). In contrast, research from Mexico suggests that, despite declining total and within-group income inequality at the national level from the mid-1990s to 2010, inequality across ethnic groups may be growing. Income growth has been slower for indigenous than non-indigenous populations, and differences in the incidence of poverty have increased (Servan-Mori et al., 2014).

These examples illustrate how declining overall income inequality does not automatically translate into improved welfare outcomes for all disadvantaged individuals or groups.

Despite efforts by many countries to promote inclusion, members of ethnic minorities, migrants, slum dwellers, persons with disabilities and other disadvantaged groups, especially women in these groups, are more likely to live in poverty, may experience deeper poverty than the rest of the population and are more likely to remain in poverty over the long term. Caste, ethnicity, religious affiliation and class heighten the risk of chronic poverty and of transmitting poverty to the next generation (Dang and Lanjouw, 2015, 2018; Sumner, 2013; Reddy, 2015).

Where people live has a strong influence on their likelihood of struggling in poverty and, more broadly, on their opportunities in life. This spatial dimension is just as important in explaining differences within countries as differences among countries. Spatial inequalities are particularly noteworthy between urban and rural areas, among different subregions within a country and among neighbourhoods within cities, often due to lower levels of public investment in infrastructure and poorer access to essential services. Rural areas account for about half the global population, but some 80 per cent of people living in poverty (The World Bank, 2016; United Nations, 2018a). This said, urban poverty is growing significantly, with the number of slum dwellers increasing from 800 million in 2010 to over 1 billion in 2018 (United Nations, 2020a).

Members of groups being left behind often suffer from multiple disadvantages, which in combination compound each other and deepen exclusion. Identifying these intersectionalities helps direct policymakers towards interventions that effectively address them, with the view to leaving no one behind.

Trends in group-based inequality

Leaving no one behind calls for reductions in group-based inequalities. Some positive trends are evident, from declining inequalities in access to primary education to the broader representation of disadvantaged groups in political processes (United Nations, 2016). Major progress in fulfilling essential needs, such as improved child health and completion of primary education, has helped close gaps. For example, disparities in child stunting based on household

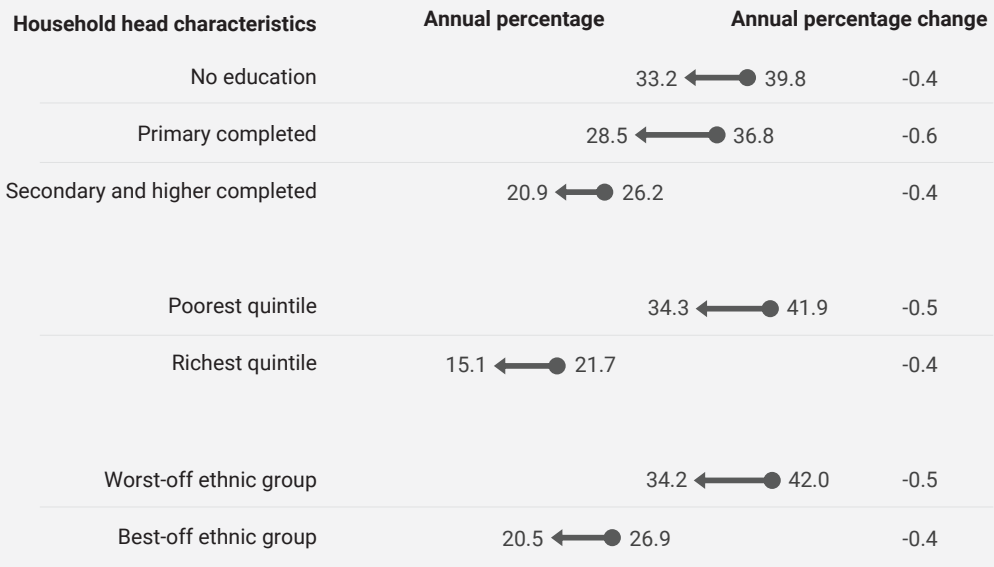
wealth and the educational level and ethnicity of the household head have fallen (figure 6.6).

Countries are still off track in terms of ensuring equal opportunity for all by 2030, however. At the rate of progress observed from the 1990s to the 2010s, it will take more than four decades to close the stunting gap related to ethnicity, for instance.

Access to good-quality education can help level the playing field or reinforce existing inequalities, depending on how it is distributed. Building on notable global success in providing primary education, the percentage of adolescents attending secondary school is growing across developing regions with data, but not by enough to close existing gaps. On average, progress in secondary school attendance is slower among children from households in the lowest wealth quintile and among those in the most disadvantaged ethnic groups in the countries, as shown in figure 6.7.

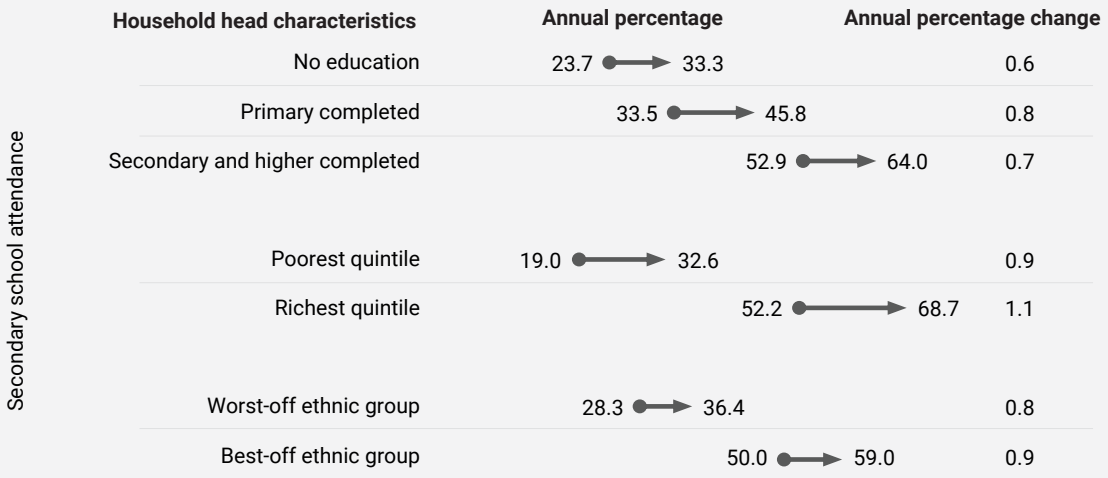
While gender inequality in basic health and education achievements has declined,[11] disparities in enhanced capabilities remain (UNDP, 2019). The transition from education to work, for instance, is marked by gender inequality, partly associated with women's reproductive and traditional care roles. Data for 115 countries show a median wage gap of 14 per cent between

FIGURE 6.6 TRENDS IN THE PROPORTION OF STUNTED CHILDREN BY SOCIOECONOMIC STATUS AND ETHNIC GROUP, 1990S TO 2010S



11 This has been observed both at the global and the regional level. See for instance ESCWA (2019) on progress in alleviating gender inequality in the Arab region.

FIGURE 6.7 TRENDS IN SECONDARY SCHOOL ATTENDANCE BY ETHNIC GROUP AND SOCIOECONOMIC STATUS, 2000S TO 2010S



Source: United Nations, 2020a, based on data obtained from Multiple Indicator Cluster Surveys and Demographic and Health Surveys.

Note: Stunting estimates by household wealth are based on data for 54 countries. Stunting estimates by education of the household head are based on data for 51 countries. Estimates by ethnic group are based on data for 23 countries, including 17 in Africa, 3 in Latin America and the Caribbean, 2 in Asia and 1 in Europe. Secondary school attendance estimates by household wealth are based on data for 51 countries and by education of the household head for 50 countries. Estimates by ethnic group are based on data for 26 countries, including 16 in Africa, 5 in Latin American and the Caribbean, 4 in Asia and 1 in Europe. See United Nations (2020b) for additional information.

men and women. This gap remains largely unchanged even after accounting for differences in education, age or experience (ILO, 2020b).

Progress in reducing gender inequalities with respect to basic capabilities has been remarkable.[12] But personal and social conventions continue to act as a glass ceiling holding women back from enhanced capabilities linked to positions of greater responsibility, leadership and social payoffs in markets, social life and politics. For example, despite increasing gender parity in entry-level political participation, women are severely underrepresented in positions of greater power and responsibility – the gender gap for Heads of State and Government is almost 90 per cent. In access to economic opportunities, women are overrepresented in vulnerable activities like contributing family workers, but greatly underrepresented among formal employees and top earners (figure 6.8). Based on current trends, it would take over 200 years to close the gender gap in economic opportunity (UNDP, 2019). Moreover, progress is slowing.

Gender inequalities in terms of social, political and economic power also exist within households (Malapit and Quisumbing,

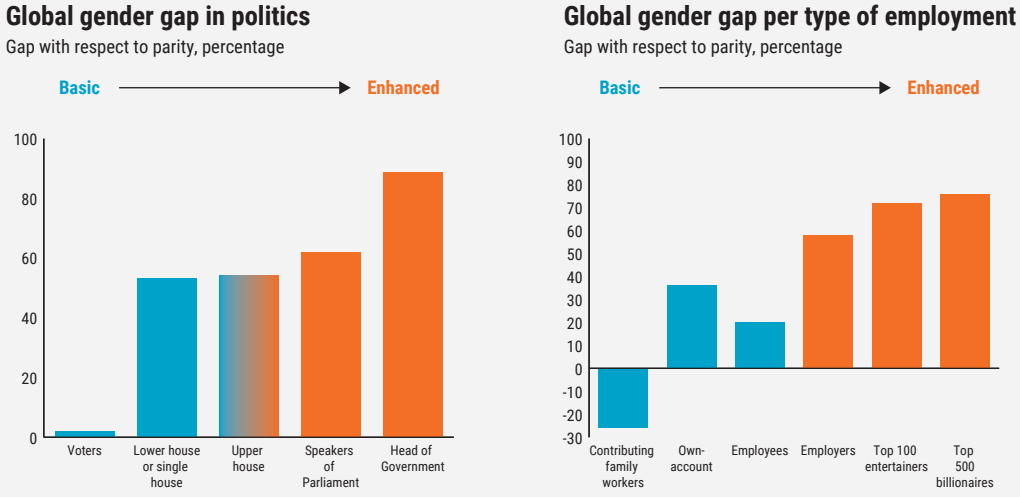
12 ESCAP (2019), for example, shows that women's outcomes have converged or exceeded those of men's in education, across many countries in Asia and the Pacific.

2016). Resources are not distributed evenly there. Boys benefit more than girls from investments in health care, private education and childcare, for instance (United Nations, 2015). A study of 30 countries in sub-Saharan Africa shows that women are more likely to be undernourished than men, and that half of undernourished women and children are found in non-poor households (Brown, Ravallion and van de Walle, 2017).

In sum, opportunity gaps among different groups are widespread and not disappearing. Children's chances in life continue to depend on who their parents are, where they live and what they own. Disparities are declining in some basic areas such as stunting, but are growing in more advanced determinants of well-being, such as access to secondary education. Unless progress accelerates, leaving no one behind will remain an unmet challenge.

Making faster progress continues to be stymied in part by the lack of data, which limits understanding and conclusions about inequalities within and among social groups. With regard to ethnicity, for instance, information on small minority groups may be limited and costly to collect. The politicized nature of ethnicity can also complicate data collection (Canelas and Gisselquist, 2019). Additionally, people are left behind in many domains of life – social, economic, political and others. Translating the multiple disadvantages they experience into a limited set of indicators and finding data to measure them present considerable obstacles. The effects of social exclusion on a person's dignity and their agency, for example, are difficult to measure, but can undermine the sense of well-being (United Nations, 2016; UNDP, 2019).

FIGURE 6.8 GENDER GAPS IN POLITICS AND EMPLOYMENT REMAIN WIDE



Note: Assumes equal proportion of women and men in the voting population.

Source: UNDP 2019, based on data from World Values Survey, the Inter-Parliamentary Union, ILO and Forbes.

Discrimination and inequality

Much has been done to end legally imposed discrimination against individuals and groups, but biased norms and interpersonal instances of discrimination remain widespread. Discrimination in law according to sexual orientation and gender identity is particularly common.[13] Inequalities are often rooted in historical circumstances but tend to persist after the structural conditions that created them change. Persons of African descent, for instance, continue to experience significant disadvantages in South Africa and other countries that no longer impose formal barriers to racial minorities (United Nations, 2016).

The legacy of past inequalities has a direct effect on present opportunities and outcomes, regardless of whether discriminatory behaviours persist or have been eradicated. Groups that suffered from discrimination in the past start off with fewer assets, and less social capital and political power than those who historically had privileged positions. Gaps are sustained through inequality in education and knowledge, income, career paths, engagement in the knowledge society and access to social protection systems (ECLAC, 2018).

Institutional arrangements, such as judicial processes and political deliberation, often facilitate the reproduction and accumulation of disadvantages and advantages over time. In many countries, minorities are overrepresented in penal institutions, and discriminated against in obtaining civil registration and identity documentation.

THE IMPACTS OF INEQUALITY

Equality is important for social cohesion and political stability, as it propitiates an environment of trust, cooperation and growth. By contrast, inequality can be harmful to peaceful coexistence among individuals in a society, creating disincentives for innovation and investment (ECLAC, 2018). This section highlights some of the main economic and social impacts of inequality.

Institutional impacts

The perception of inequality as supporting a system that is "unfair" undermines trust in institutions that are supposed to protect individuals and enterprises, and can encourage corruption and crime. There can also be adverse effects on tax collection and a decline in resources for public goods.

Inequality has an adverse effect on labour market institutions. In particular, rising levels of inequality in employment rights among workers, such as through increased non-standard forms of employment, including temporary work or zero-hours contracts, weaken the representation of workers and the process of social dialogue. This results in impacts on earnings and the working conditions of wage employees. When labour markets are polarized between formal and informal workers, instruments to reduce in-work poverty and inequality, such as minimum wages, lose their potential to benefit those at the low end of the distribution (ILO, 2019b).

13 The International Lesbian, Gay, Bisexual, Trans and Intersex Association lists 68 countries that have criminal laws against sexual activity by lesbian, homosexual, bisexual, transgender or intersex people, and 11 countries where the death penalty can be imposed for such activity.

Economic impacts

Increasing income inequality negatively affects economic growth and its sustainability.[14] Since lower- and middle-income households are more likely to consume, higher disposable income at these levels automatically increases aggregate demand and output growth. But the opposite is true as well. Moreover, higher inequality tends to preclude investment in human and physical capital, which hinders social mobility and is also harmful for economic growth (Cingano, 2014; OECD, 2015). This may lead to a less productive and motivated workforce, and eventually result in a level of growth below that which would have been achieved under a more equitable distribution of income and opportunities. High inequality essentially polarizes society in terms of income and opportunities, making the poor and the middle class less likely to contribute to and benefit from growth, while the rich get a bigger slice of the cake without necessarily making the cake any bigger (Keeley, 2015).

Extreme deprivations

Inequality is an obstacle to the 2030 Agenda for Sustainable Development and in particular its Goals linked to overcoming extreme deprivations, such as SDG 1 on the eradication of poverty and SDG 2 on ending hunger (box 6.2).

Effects on social and political stability

The compounding effects of higher inequalities and limited social mobility can ignite popular

BOX 6.2 INEQUALITY UNDERCUTS FOOD SECURITY AND NUTRITION

Inequality increases the likelihood of severe food insecurity, and hinders efforts to eradicate hunger and malnutrition in all its forms. On average, low- and middle-income countries with a Gini coefficient higher than 0.35 have a 33-percentage-point higher probability of experiencing severe food insecurity than countries with a lower Gini index. Severe food insecurity is almost three times more prevalent in countries with high income inequality (21 per cent) compared with countries with low income inequality (7 per cent).

Under a "business as usual" scenario that leaves existing inequalities unattended, undernourishment will still be significant by 2050. Alternatively, a sustainable development scenario with equitable access to basic services, as well as universal and sustainable access to sufficient, safe and nutritious food, would contribute to defeating undernourishment by 2050. Achieving the latter scenario requires reducing the income gap between high-income, and low- and middle-income countries. Within countries, food distribution must improve through more equitable purchasing power.

Income and wealth inequalities are closely associated with undernutrition, while more complex inequality patterns are linked with obesity. In general, economic inequalities play a significant role in determining access to multiple dimensions of health, nutrition and care. For example, in most countries, stunting prevalence among children younger than 5 years of age is about 2.5 times higher in the lowest wealth quintile compared with the highest wealth quintile. Inequality in stunting levels is also linked to the level of education among mothers. A mother with less education has a greater likelihood of having a stunted child.

Source: FAO, 2018a; FAO et al., 2019; de Onis and Branca, 2016; Black et al., 2013.

14 For example, Dablas et al. (2015) show that when the income share of the top (bottom) 20 per cent increases by 1 percentage point, GDP growth is 0.8 percentage points lower (0.38 percentage points higher) in the following five years. Estimates for the OECD suggest that a 1-point increase in the Gini coefficient is associated with a 0.12-point loss of GDP per capita growth (OECD, 2014).

dissatisfaction, leading to social unrest, and even conflicts and wars. Group-based inequality in particular can be an important cause of conflict, driven by a sense of exclusion from opportunities and decision-making. Youth, for example, who in many instances do not feel represented by political leaders, have led recent waves of protests in different parts of the world (Mokleiv Nygard, 2018; Cramer, 2006).

PART 2. Shaping inequalities

building on its analysis of the extent, evolution and consequences of inequalities, this chapter explores drivers and solutions, emphasizing three points. First, inequalities are embedded in socioeconomic systems and depend on how societies are organized, and the underlying distribution of power in markets, cities and rural areas, and households. Second, if nothing is done, the megatrends that are transforming the world – climate change, the fourth technological revolution, urbanization – are likely to make inequalities worse.

Third, inequality is not destiny. Trends differ even among countries within the same region, at similar levels of development and facing comparable conditions in terms of geography, endowment of natural resources, productive structure and so on. Many countries in the two regions with the highest inequality, Africa and Latin America, have recently seen the Gini coefficient of inequality decline. Success stories in reducing inequality or keeping it at low levels illustrate that it is possible to move towards equity. But an approach addressing multiple fronts is necessary, built around policies empowering people by building capabilities, providing protection and upholding dignity. Measures are required to diffuse innovation, and limit unfair concentrations of power and privileges.

The COVID-19 crisis (box 6.3) can be a game changer. It has shown how inequality matters in a fundamental way. Everyone on the planet has been affected. But while some have been able to continue their lives, adequately protected and taking advantage of the privileges of the twenty-first century to work and learn from home, with steady income as well as access to goods and services, many others, in particular those in informal urban jobs, face an ongoing humanitarian crisis. They confront tragic choices to protect their health and lives or maintain their livelihoods (UNDP, 2020; United Nations, 2020b).

The world is at a critical juncture. An insufficient response to the pandemic can push countries towards negative pathways, deepening inequality, increasing poverty, worsening food insecurity and malnutrition, intensifying public discontent and weakening trust in institutions. These effects could last for years and even scar future generations. At the same time, the crisis is ushering in new awareness of the social and economic risks of deficient social protection systems and inadequate public services, and underscoring the importance of collective action and global collaboration. It could lead to the transformational changes needed to build more equitable societies and leave no one behind. This has happened in other historical moments.[15] It can happen again now.

15 Historically, policies implemented in the aftermath of major crises often helped reduce inequality and reshaped the world for the better. Consider the United States, for instance, which created Social Security in the aftermath of the Great Depression. Similarly, the United Kingdom established its universal health-care system after World War II.

BOX 6.3 COVID-19 SPOTLIGHTS MULTIPLE STRIKING DISPARITIES

The COVID-19 crisis affects all people and countries, but with striking inequalities in exposure, vulnerability, and the ability to cope with both the pandemic and its socioeconomic consequences (see table).

People living in poverty and members of disadvantaged groups are less well equipped to prevent the spread of COVID-19. Physical distancing is challenging for people who live in small, crowded dwellings, in slums or poor rural areas. Frequent handwashing, which has been recommended to reduce exposure, is not an option for the 3 billion people without handwashing facilities at home. Once exposed, people in disadvantaged groups are at a higher risk of dying, either because they do not have access to health care or because they cannot afford it. In addition, the incidences of pre-existing conditions such as lung diseases, diabetes and cardiovascular diseases that increase death rates are higher among such groups.

Abilities to cope with the economic and social devastation of the pandemic are unequally distributed as well. People without savings or access to social protection are more likely to fall into poverty or sink into deeper poverty due to health shocks or through economic downfalls caused by both the health crisis and the lockdowns to control it. The hardest-hit sectors have a high proportion of workers in informal employment, with limited social protection.[1] Many are left to choose between health and economic welfare, or, worse yet, between illness due to the virus and illness due to hunger and malnutrition. The number of people experiencing hunger could increase by millions given existing inequalities in access to sufficient and nutritious food.

New technologies, including the Internet, have proven crucial to support physical distancing measures and mitigate the crisis. They have sustained some economic and educational activities, and even channelled emergency support from the government amid widespread lockdowns. Yet access to these technologies remains unequally distributed. Gaps in Internet and computer ownership have tended to grow over the last decade, both within and among countries.[2]

While the COVID-19 crisis is still unfolding, there is every reason to think that poverty and inequality will intensify, at least in the short term. Preliminary estimates suggest that extreme poverty could increase by as much as 6 percentage points – that is, 400 million people by 2020.[3]

TABLE TITLE

	Effects	Interplay with inequality
Direct effects	More than 800,000 deaths and 23 million infected as of 23 August, 2020	Exposure greater in areas without handwashing facilities (3 billion people), slums, households without access to Internet or means to afford physical distancing, and among essential workers. Fragility greater among groups with pre-existing conditions, older people and those without access to medical services.
Indirect effects	Extreme poverty to increase by 70 million to 400 million people.	Likely to affect vulnerable groups: low-income groups, people in rural areas, indigenous groups, migrants, etc.
	Undernourishment to increase by 14 million to 80 million people	
	In the second quarter of 2020, reduction in hours worked equivalent to 400 million full time workers	More intense among workers at the low end of the income scale, particularly workers in the informal economy who cannot afford to stop working or cannot work from home.
	1.5 billion children out of school	With greater costs in areas without access to Internet or broadband, and without resources for a safe reopening.
	Increase in domestic violence and the care burden for women	Affecting women and girls, in particular, those in vulnerable groups.

Source: Elaboration based on FAO (2020); ILO (2020d); Sumner, Ortiz-Juarez and Hoy (2020); United Nations (2019); UNDP (2020); The World Bank (2020).

1 ILO, 2020a.
2 See UNDP, 2019, 2020.
3 Sumner, Ortiz-Juarez and Hoy, 2020.

DRIVERS OF INEQUALITY

Various intersecting forces drive disparities in the distribution of income and wealth, both within and among countries. Distributional changes can stem from the heterogeneity of the production structure; deepening globalization and the growing financialization of the world economy; the rising concentration of corporate power in production and finance, and through unequal trade relations centred on global value chains and digital platforms; and pressures around fiscal austerity (UNCTAD, 2017, 2018, 2019).[16]

Inequality is strongly conditioned by changes in the production structure, which varies significantly among and within countries. Different access to technology, financing and external markets between large, formal enterprises and small and informal microenterprises translates into inequality in income and wealth within countries, as well as inequality in education and knowledge, career paths, engagement in the knowledge society and access to social protection systems.

In general, the transition from agriculture to manufacturing has stagnated, and the services sector is split between high-end services and a mushrooming informal economy. Employment in post-industrial societies has transitioned from well-paid manufacturing jobs to those in services. At the high end, the latter include jobs in finance, insurance and real estate. At the low end, they entail jobs in customer service. Emerging economies have tapped low-wage, poorly organized labour in manufacturing, while low-income countries face cheap imports and unfair trade practices in their attempt to diversify beyond agriculture. Foreign direct investment largely ends up in extractive industries and comes without technology transfers.

Labour markets play a pivotal role in shaping inequality, particularly within countries. In almost all countries, if not all, income from work remains the main source of income for most households. Insufficient employment creation tends to increase informality, which affects about 61 per cent of the employed population in the world (ILO, 2018c). Increases in informal employment generally push inequality upward.

Globalization has spurred global competition for capital, investment, jobs and customers with capital becoming increasingly global and mobile, and labour still largely nationally regulated and location-bound. This dynamic has increased the returns to capital and the wages of highly skilled workers, at the expense of lower-skilled workers. The erosion of collective bargaining has undermined the ability of workers to mobilize collectively for political change, affecting the distribution of income in many parts of the world (ILO, 2015).

Some observers have seen a direct link between income distribution and the financial crisis (Milanovic, 2010; Rajan, 2010). Moreover, empirical evidence suggests that financial crises become more frequent and widespread when income inequality is rising (UNCTAD, 2017). Yet even beyond financial crises, increased financialization has come with worsening income and wealth distribution. As the financial sector captures a rising proportion of income in most countries, those at the bottom of the distribution experience an

16 These common factors have been analysed in recent studies, with some identifying similar factors behind a "rent-seeking" economic model propelling rising inequality (Galbraith, 2012; Stiglitz, 2012). See also Piketty (2020), Alvaredo and Gasparini (2015), Milanovic (2016) and Patnaik (2010).

increased debt burden, as well as restricted employment and income generation (ibid.).

The growth of financial activities has been closely associated with rent extraction by tiny elites. As Stiglitz (2015, p. 141) points out, rent-seeking means "getting an income not as a reward for creating wealth but by grabbing a larger share of wealth that would have been produced anyway". A new generation of rentiers has emerged alongside the deregulation of financial markets and the increasingly footloose nature of capital.

The rise in the market concentration of the top 100 firms in any given economy and the top transnational corporations has also exerted a direct influence on income distribution. Figure 6.9 presents the inverse relationship between the share of labour and the share of the profits of the top 2,000 transnational corporations in global income.

MEGATRENDS AND INEQUALITY

The impacts of the megatrends considered in this report on various dimensions of inequality are broad and varied, both within and among countries. Some may help equalize opportunities but exacerbate income inequality. Some are taking a toll on the poorest countries and groups. Others benefit mainly the better off.

These megatrends interact with each other and affect inequality both directly and indirectly. Other things being equal, for example, technological innovation benefits some groups, firms and countries more than others. But it can also help mitigate the consequences of climate change, which affect disadvantaged groups and countries more than others. It can alter the impact of climate change on migration and the speed of urbanization, with indirect effects on inequality. Similar multiple interactions are apparent with other megatrends, requiring policy attention and consideration in impact analyses.

FIGURE 6.9 HOW MARKET CONCENTRATION AND GLOBAL FUNCTIONAL INCOME DISTRIBUTION CHANGED FROM 1995 TO 2016

Sources: United Nations Conference on Trade and Development (UNCTAD) database of consolidated financial statements, based on Thomson Reuters Worldscope and UNCTAD's World Economy Database.

Climate change

Climate change may drive up inequality within countries and even reverse current progress in reducing inequality among countries. The fallout on income, health, education and other indicators of well-being is not uniform across countries or population groups. Rising temperatures have adversely affected economic growth in the world's poorest countries, which bear less responsibility for climate change in the first place. The ratio between the income of the richest and poorest 10 per cent of the global population is estimated to be 25 per cent larger than it would be in a world without global warming (Diffenbaugh and Burke, 2019).

Within countries, people living in poverty and other disadvantaged groups, including indigenous peoples and small landholders, are often in rural areas. Highly dependent on agricultural, fishing and other ecosystem-related income, they are disproportionately exposed to climate change yet have fewer resources to cope with and recover from its impacts. These comprise changes in agricultural production, weather-related disasters, and environmentally triggered health problems such as infectious and respiratory diseases. Estimates suggest that, even under a low-impact scenario where climate change mitigation and adaption strategies are successful, between 3 million and 16 million people could fall into poverty by 2030 because of climate change. Under a high-impact scenario, poverty could affect between 35 million and 122 million additional people (Hallegatte et al., 2016).

Climate change deepens intergenerational inequity by reducing the livelihood opportunities of future generations, exacerbating downward intergenerational mobility. It can worsen urban inequalities, since low-income households in cities often reside in low-lying areas exposed to rising sea levels, heat zones and other locations most vulnerable to extreme weather events.

High and growing inequality can in turn hinder climate action, including by limiting the diffusion of technologies to mitigate climate change or reduce environmental degradation. Oxfam (2016) shows that more unequal high-income countries and emerging economies contribute more to climate change via pollution, waste generation and carbon emissions than their more equal counterparts.

All of these issues underscore that it is critical to address inequality and climate change together.

Technological change

Technological change tends to create winners and losers (that is, it drives inequality upwards), despite its promise. Technological innovations usually replace specific tasks, and their overall impact on employment depends on how jobs are redesigned and tasks regrouped into new or existing jobs, and on the extent to which they also generate new jobs and tasks.

So far, highly skilled workers are benefiting the most from new technologies. Job disruption – and, at times, destruction – thus affects mainly low- and middle-skilled workers in routine manual and cognitive tasks, where automation is most prevalent. Moreover, in many countries, the extraordinary gains brought about by new technologies are being captured by a small number of dominant companies. If these trends continue, they will lead to even greater polarization of the labour force, with

less demand for middle-skilled workers.[17] They will also intensify wage inequality.

At the same time, digital innovation and artificial intelligence are opening opportunities in sectors such as education, health, banking and public service delivery, with far-reaching implications for equality, as well as governance and participation. Technology and its diffusion can address climate challenges and advance the transition towards more sustainable forms of production.

The potential of new technologies to foster sustainable development can only be realized, however, if everyone has access to them. Regrettably, new technologies are often reinforcing various forms of inequality and creating new "digital divides". Access to basic technologies such as mobile phones has improved rapidly, but gaps in access to the Internet and computers persist. Close to 87 per cent of the population of developed countries has Internet access, compared to 19 per cent in the least developed countries. The potential of new technologies is particularly strong for youth, but it can also widen the divide between younger and older people. Gaps in access and skills can push poorer countries and disadvantaged groups ever further behind. Many of the benefits from new technologies that developing countries could realize may not materialize if governments and leading firms, which are often located in developed countries, fail to reduce barriers to use.

The deployment of new technologies can exacerbate inequalities even in contexts of broad accessibility. Gaps in education can widen, for instance, if new technologies primarily benefit those pursuing tertiary education, or if they disproportionately improve the learning outcomes of children in wealthier households. Health gaps widened in the past with the introduction of health technologies, and did not automatically decline as these technologies spread.

Beyond their sector-specific impacts, new technologies can also reproduce or exacerbate group-based inequality due to potential biases in artificial intelligence algorithms used in decision-making systems for job recruitment, for instance. These may reinforce discrimination against groups including women and ethnic minorities when they are based on biased historical data.

As in any process of rapid structural change, technological innovation can be disruptive. But how it shapes development and societies does not need to be left to chance. The direction of technological change must be an explicit concern for governments, which through proactive policies and supportive institutions can help ensure that technological dividends are broadly shared.

Urbanization

Cities are catalysts for economic growth, innovation and employment, yet urban areas are more unequal than rural ones. In most cities and towns, neighbourhoods characterized by high levels of wealth and modern infrastructure coexist with those experiencing severe deprivation and lack of services, often side by side.

Inequality within urban areas has economic, social and spatial dimensions. Economically, income is generally greater in cities than in rural areas. Socially, rapid urbanization has led to growing concerns about deteriorating

17 The relative position of this group is aggravated by the fact that a middle-skilled job does not ensure access to the middle (income) class. Increasingly at least one high-skill earner in the family is required to access the "middle class". See OECD 2019a.

health conditions. Even if maternal and child health are generally better in urban than in rural areas, they are at times worse in urban slums and other poor neighbourhoods of cities than in rural areas. Spatially, land and housing markets as well as poor urban planning can concentrate disadvantages in specific locations and lead to a vicious cycle of exclusion and marginalization. In 2018, over 1 billion people (one in four urban residents) lived in slums, the most visible symptom of exclusion in divided cities (United Nations, 2020a).

Levels of inequality and poverty vary greatly by city, even within a single country. Although spatial segregation and exclusion, based on income, race, migratory status or other factors, are common to many urban areas, cities are unique, with different histories and patterns. Inequalities have increased in some as they have grown and developed, but have declined in others. This underscores how in an increasingly urban world, inclusive city planning and management are essential to steer cities in directions that reduce inequality, among other development goals.

REDUCING INEQUALITIES IN AN INTERCONNECTED WORLD

High and growing inequalities have marked the first part of the twenty-first century. This is a central challenge to the 2030 Agenda and the sustainability of human well-being. Inequalities stand to continue widening as a result of climate change and other global trends, including the COVID-19 crisis. But such outcomes are not inevitable. A quick and bold response to the pandemic, for instance, coupled with long-term, structural policy changes aimed at building back better, could lead to fairer and more inclusive societies. The many success stories in reducing inequality or keeping it at low levels illustrate the possibilities, while underlining the importance of national policy choices and local institutions.

There is no silver bullet to reduce inequalities, no single set of inequality-reducing policies applicable to all countries or contexts. Rather than providing a comprehensive assessment of relevant policies, this section highlights three building blocks of policies that should be part of any coherent, integrated strategy to reduce inequality in all its dimensions. The first building block includes policies to expand capabilities and promote more equitable access to opportunities, thereby altering the distribution of market or gross income. The second encompasses policies that affect the distribution of income, wages and profits. The third considers policies to address prejudice and discrimination, and promote the participation of disadvantaged groups in economic, social and political life.

These three building blocks are interdependent. Promoting opportunities, including through strong public education and health systems, requires public funds that are mainly raised through taxes, for example. Taxes, in turn, affect the distribution of disposable income.

There is ample evidence of what has and has not worked to reduce inequality under each of the three. Mobilizing support for policy responses to inequality can be an uphill battle, however, as they will inevitably challenge the interests of powerful and wealthy individuals and groups. At their core, they affect the balance of power. Understanding the political constraints to reducing inequality and devising ways to overcome them is critical to break the current stalemate.

Expanding people's access to opportunity

Equal opportunity requires giving all children the same chances to acquire capabilities and

eventually reap returns from their education through decent jobs, regardless of where they live and the conditions in which they were raised. Education, health and labour market policies affect the distribution of human capital, skills and wages. In principle, they should foster intergenerational mobility and affect how incomes are generated, reducing disparities in market income. The cost of education and health have increased exponentially in recent decades, as they have become increasingly privatized. It is time to take these fundamental services out of the market and place them fully in the public domain so the rights to quality health and education are a reality for all.

AIMING FOR UNIVERSAL, QUALITY EDUCATION

There is broad agreement on the importance of ensuring universal access to quality education, but the provision of education and other essential services remains fragmented and exclusionary in many countries. Even under universal public education systems, there are often vast differences in the quality of education provided to children in urban and rural areas, or from more and less wealthy families. Children in middle- and high-income households in urban areas often benefit more from government spending on education than those in low-income groups in rural areas. There are also significant disparities among income groups within cities.

Investments in education must start in early childhood. Care must also be taken to ensure improved access to education does not result in increased inequality in learning outcomes stemming from disparities among schools based on geography, socioeconomic status, race and ethnicity (Torpey-Saboe, 2018; UNESCO, 2019). Countries that have made progress in improving learning outcomes have invested in training teachers and increased their salaries; they have also made efforts to deploy teachers equitably across regions and areas.[18] Other countries still need to establish minimum levels of proficiency. Many must finance national assessments to evaluate learning outcomes, teacher training and curricula.

Changes in the world of work, including those triggered by technological innovation, make lifelong learning increasingly important. So far, however, highly skilled workers are those benefitting the most from skills upgrading and all forms of continuous education. Policies are needed to encourage and facilitate access to opportunities for workers at all levels of income and educational achievement.

INVESTING IN DECENT WORK

Improvements in education will have little effect on inequality without successful school-to-work transitions and decent job prospects. Current labour market trends, including growing unemployment, underemployment and rising wage inequalities, are clearly unsustainable. While global integration may have increased returns to capital, and, together with technological change, pushed up the wages of highly skilled workers, a variety of employment and wage trends across countries suggests that national policies and institutions need to do more to promote employment and decent work. In the immediate aftermath of the COVID-19 crisis, not only should governments maintain extraordinary measures to ensure income and employment protection, but they must also facilitate a safe return to work, including for workers deemed essential. In all countries,

18 These include developed countries, such as Australia, Finland, Japan and Sweden, as well as developing ones, including Brazil, China, Kazakhstan and the Republic of Korea (Wei, Andree and Darling-Hammond, 2009; Global Campaign for Education and Education International, 2012).

the self-employed and those with small and medium enterprises can be supported through low-interest microloans and credit guarantees.

In the longer term, there are opportunities to generate stable, decent jobs as countries expand the provision of quality services, including in the care economy as countries age and women's participation in formal employment grows. New avenues for employment will also emerge from "greening" economies.

In its recent report, the Global Commission on the Future of Work noted the stark contrast between the transformative changes under way in the world of work and the level of preparedness of societies, governments and the international community to manage them (ILO, 2019b). An initial step towards addressing this disconnect is to increase investments in labour market institutions, including those that represent workers, and oversee minimum wages and active labour market policies.

On average, unionized workers earn higher wages than their non-unionized counterparts, with the union-wage effect being greater among less-skilled workers than among skilled workers, especially in the public sector (Card, Lemieux and Riddell, 2018; Herzer, 2016; Freeman, 2009). Membership in trade unions has been declining, however.[19] Efforts to reverse this trend are necessary, and given ongoing changes in work, unions will also have to find ways to connect with workers outside traditional workspaces, advocate for new forms of decent employment that ensure worker protection, and offer new services, such as sharing information about the portability of benefits. There is also scope to expand union membership to workers in informal employment and own-account workers.

Associations of self-employed workers or cooperatives – two different types of membership-based organizations – have improved the terms on which workers in vulnerable employment engage in the labour market, though they usually do not have a legal mandate to participate in collective bargaining directly. Supporting laws can make new forms of association fit for collective representation. For now, they cannot substitute for traditional trade unions.

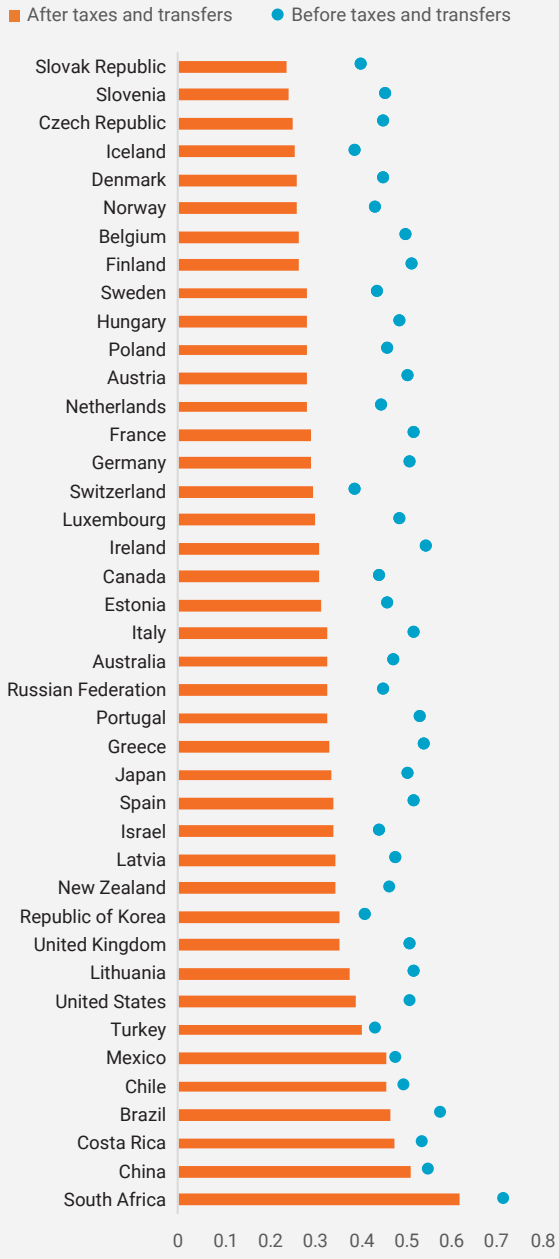
Wage-setting mechanisms must also be strengthened. Minimum-wage policies have helped reduce wage inequality without reducing employment levels, partly because minimum wages are often set at very low levels. While these policies only cover workers in formal employment, evidence from developing countries indicates that minimum wages can drive increases in earnings in the informal sector as well, mainly because they are taken as a reference for less-skilled workers throughout the economy (Rani, 2017; Dinkelman and Ranchhod, 2012; Khamis, 2008).

All workers, regardless of wages or skills, will experience an increasing number of job transitions over the course of their lives. Active labour market policies can support these transitions by improving job matching and fostering new job opportunities. Such policies must be designed and implemented with a view to reaching the poorest and those in informal employment, however. New technologies can extend the reach of labour intermediation and improve information on job opportunities.

19 The percentage of employees who are members of trade unions declined in 60 out of 88 countries with data between 2004 and 2016. In OECD countries, trade union membership is half of its 1985 level (OECD, 2017).

FIGURE 6.10 GINI COEFFICIENT BEFORE AND AFTER TAXES AND TRANSFERS

Upper-middle- and high-income countries, latest available data



Source: United Nations, on the basis of the OECD Income Distribution Database, accessed 10 February 2020.

Note: Data are for the 2015-2017 period, with the exceptions of China (2011) and Brazil (2013).

Promoting redistribution and strengthening social protection

Evidence from upper-middle-income and high-income countries suggests that the impact of redistribution through taxes and transfers can be significant, especially where the welfare state is more developed (figure 6.10).[20] Redistributive policies thus have an important role to play.

Fiscal policies affect inequality not only through a direct bearing on income distribution, but also through mobilizing resources for social policies, including on education, health care and social protection, all of which are crucial to promoting equal opportunity and expanding capabilities. Trust in governments and institutions is higher where taxes and social transfers are perceived to be effective and equitable (OECD, 2019b). At the same time, confidence in public institutions is essential to ensuring fiscal performance and preserving the social contract.

A sustained reduction of inequality also calls for aligning macroeconomic policy frameworks with social goals, with coherent policies that achieve the right balance between macroeconomic stability and appropriate levels of social spending and public investment in infrastructure and technologies, all of which are critical to reducing inequality.

PROGRESSIVE TAXATION

The effect of fiscal policy on inequality depends on the progressivity of the tax system, the total amount collected in taxes, and allocations to social

20 This analysis is based on pensions as transfers (as opposed to "deferred income"). There is not a clear-cut way of deciding which approach is superior. But there are important quantitative implications. For instance, for the European Union (28 countries), the effect of redistribution is 19 Gini points with old-age pensions as pure transfers; the effect is 7.7 Gini points with old-age pensions as pure "deferred income" (see UNDP, 2019, spotlight 3.3).

protection transfers and public services. Taxes and transfers play an important role in reducing income inequality in developed countries (United Nations, 2020b) but fiscal redistribution is much more limited in developing countries given their stronger reliance on indirect taxes, which are usually regressive. Narrow tax bases, high levels of informality, capital flight, illicit financial flows and weak tax administrations have typically limited the ability of governments in developing countries to collect personal income taxes. Despite a global commitment to enhance revenue administration, non-compliance with income tax requirements and tax evasion remain high.

Given the increasingly globalized nature of trade and business, there are limits to what countries can achieve on their own. As global firms grow, production becomes more fragmented, and the relevance of intangible assets such as intellectual property rises, making the taxation of capital increasingly challenging. International tax cooperation is essential to ensure sustained tax revenues. Yet while there are several initiatives in place to strengthen tax cooperation, progress has been very slow.[21]

With the rising share of market income earned by people in the top percentiles, there may in fact be scope for increasing top marginal tax rates. Enhanced tax collection and enforcement are also needed for top earners, who often escape taxation altogether. Taxes on wealth, real estate and inheritance have gained traction in recent political debates and can play an important role in increasing redistribution. Property taxes present a promising, progressive and reliable endogenous source of revenue to finance public investments in infrastructure and basic services. This is especially so in municipalities, in both developing and developed countries, that have the authority to assess property values and regulate rate collection.

Income from wealth (profits, interest and capital gains, in particular) is generally taxed at lower rates than labour income. Concurrently, the effective taxation of wealth income has declined significantly given the many options to avoid taxation and the ability to invest savings abroad. Only three countries currently impose a wealth tax. Revenues from taxes on wealth transfers declined from 1.1 per cent of total taxation in 1965 to 0.4 per cent in 2015 (OECD, 2018). Given the amount of revenue that can be raised through wealth and property taxes, devoting resources to their enforcement may be worth the cost.

Addressing inequality also calls for lessening the tax burden on people at the bottom of the income distribution. Raising minimum income tax thresholds and reducing the burden of indirect taxation can help make tax systems more progressive. Lower tax rates on basic goods, such as staple foods, may also be warranted.

UNIVERSAL SOCIAL PROTECTION

Taxes are but one element of fiscal policies, albeit an essential one. How policy affects inequality and other development objectives depends also on how public social spending is distributed. Social protection transfers can play a key role in reducing inequalities in market income and, more broadly, in promoting inclusion.

COVID-19 is not the first pandemic the world has experienced, nor will it be the last global crisis. Comprehensive, universal social protection systems, when in place, play a profound role in

21 See, for instance, the United Nations Committee of Experts on International Cooperation in Tax Matters, the Global Forum on Transparency and Exchange of Information for Tax Purposes, the OECD/G20 BEPS Project, the Addis Tax Initiative and the Platform for Collaboration on Tax.

protecting the entire population and reducing inequality, much more so than ad hoc, short-term protective or stimulus measures, since they act as automatic stabilizers. COVID-19 has in fact been a stress test for social protection systems. Many countries have come up short.

To start, social protection is not a reality for a large majority of the world's population. In 2016, 55 per cent – as many as 4 billion people – were not covered by any social protection cash benefits. There were large variations across regions, from 87 per cent without coverage in sub-Saharan Africa to 14 per cent in Europe and Northern America (United Nations, 2019). As a result, the impact of social protection on reducing income inequality is much stronger in developed than developing regions (United Nations, 2018b). But even in countries with such systems, many programmes are not able to respond quickly to novel circumstances, keep up with sudden surges in demand or meet the needs of different population groups.

In general, universal and non-conditional social protection schemes are more inclusive and less likely to discriminate against people in need than targeted schemes (ibid.). They are also less likely to stigmatize beneficiaries and are easier to implement, administratively. Some population groups, however, such as persons with disabilities, members of ethnic minorities, international migrants, even children and youth, face greater challenges than others in overcoming poverty and accessing social protection benefits. Differentiated measures may be necessary to reach them and achieve universal coverage.

The *Report on the World Social Situation 2018* (ibid.) recommends a framework of universalism sensitive to difference, with targeted measures that complement, rather than replace, universal programmes such as a universal basic income (box 6.4).[22] Such a framework should include, for instance, social insurance schemes adapted to the circumstances of informal workers.

Targeted or special measures can be costly. Identifying potential beneficiaries in need of special support, as well as understanding the nature and extent of their needs, demands strong administrative capacity. Means-testing benefits has high administrative costs and requires methodologically complex surveys. Disability assessments demand substantial capacity in the health and social work sectors. Special measures therefore require investment and attention to building the capacities of social protection institutions. They should not be approached as ways to cut expenditure.

Making markets work for equality

The ways markets have developed amid globalization in finance and trade, the emergence of global value chains, improved technologies and digitalization have brought average progress, but once these are broken down, the benefits are very unevenly distributed. A significant share of rents are concentrated in the hands of a few, those leading the process. The question is how to move forward in a way that preserves and stimulates the benefits of innovation, while spreading its fruits to a broad spectrum of workers and consumers.

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22 At the regional level, ECLAC (2016a), inspired by Habermas (1998), proposed universalism sensitive to differences in Latin American and Caribbean countries. In October 2019, governments participating in the Regional Conference on Social Development in Latin America and the Caribbean adopted the Regional Agenda for Inclusive Social Development, which includes universalism that is sensitive to differences as a key principle, together with others like the rights-based approach and empowerment (ECLAC, 2019a).

BOX 6.4 UNIVERSAL BASIC INCOME: A TOOL TO REDUCE POVERTY AND INEQUALITY

Interest in a universal, unconditional and permanent cash transfer, or universal basic income (UBI), has been growing globally in the context of ongoing debates on changes in the world of work, and, more recently, in the context of the COVID-19 pandemic. Proponents see its potential to compensate workers for increasingly insecure employment while avoiding overly bureaucratic social protection systems. In developing countries, a UBI can be an important measure to address poverty and inequality. Unlike means-tested or earned benefits, payments are usually the same size and arrive without request.

A UBI is conceptualized based on diverse and sometimes conflicting notions of the role of the State and the market. In some cases, it is considered an additional pillar of the welfare State, which does not replace the services and benefits to which people are already entitled. In others, it is seen as a tool that could replace all existing social protection programmes, reducing the burden and scope of the welfare State (ECLAC, 2018). Some discussions stress potential disincentives to work, with opponents arguing that a UBI would discourage workers from finding or remaining in jobs, and that recipients would spend funds unproductively. The generosity of the benefit plays a key role in this debate.

Pilot trials of a UBI have been carried out in Canada, Finland and Kenya, and in the state of Madhya Pradesh in India and the Otjivero-Omitara area of Namibia (Henley, 2018; Gollom, 2018; Banerjee, Niehaus and Suri, 2019). In response to the COVID-19 crisis, several countries are disbursing universal cash payments. While most of these payments are only a temporary response to the current emergency, Spain has introduced a guaranteed income programme (renta mínima vital) that the Government intends to keep permanently. On inspection, the programme is not universal, however, but targeted to 2.3 million low-income persons. A widespread temporary basic income scheme of this type –ensuring a basic income to the 2.7 billion people living below or just above the poverty line in 132 developing countries—is estimated to cost between 200 and 465 billion dollars a month (Gray and Ortiz-Juarez, 2020). In developing countries, the implementation of these schemes during emergency times could raise the bar for social policy and pave the way for building a permanent universal floor of basic income.

The feasibility of financing a UBI depends on the country. In most developing countries, a UBI could only be implemented gradually, progressively and with a long-term perspective. The Economic Commission for Latin America and the Caribbean (2020) has estimated, for example, that a UBI equivalent to the value of the poverty line would cost on average 19.6 per cent of GDP for countries in the region. Even in wealthier OECD countries, current spending on social protection would not be enough to cover a UBI at or even close to the poverty line, estimated at 50 per cent of the median disposable income (OECD, 2017). A basic income for working-age adults that would cost the same as existing transfers and tax exemptions would reach 21 per cent of the poverty threshold in Italy, 33 per cent in the United Kingdom and 50 per cent in France (ibid.).

In the case of labour markets, well-managed minimum wages can be an effective instrument to protect workers' bargaining power and transmit gains in productivity to workers' income, contributing to both equity and efficiency (UNDP, 2019). This is particularly important in a context of decreased unionization and the emergence of large firms powered by the use of apps and the control of large shares of market data.[23]

Anti-trust policies can play a significant role in dealing both with the increasing market power of some global players (in particular, in high-tech sectors[24]) and with systematic collusion and abuse. Active measures not only reduce unfair rents, but also help expand markets by lowering prices and increasing consumption as people with lower-level incomes gain purchasing power.

The political economy of redistribution

In 2014, 60 per cent of respondents to a survey across 44 developed and developing countries and areas agreed with the statement that "the gap between the rich and the poor is a very big problem" (Pew Research Center, 2014).[25] Despite widespread concern about inequality, however, mobilizing support for policies to reduce it has often proven challenging.

Inequalities in political power hinder action. Groups with more influence, knowledge, resources and capacity to organize are more effective at blocking policy measures that undermine their interests or lobbying for those that promote them. Wealthy individuals, corporations, and, in some countries, members of certain ethnic groups have more access than others to political institutions such as political parties as well as the media. There are numerous historical examples of economic elites ensuring that the policies and institutions that benefit them are maintained (Acemoglu and Robinson, 2002, 2012).

The failure of taxes and transfers to significantly reduce the gap between the rich and those living in poverty, particularly in low-income countries, may also undermine the legitimacy of fiscal systems and trust in institutions,[26] which, in turn, hinders action to address inequality. Political institutions that fail to curb inequalities disenfranchise segments of the population that may otherwise push for greater redistribution, including lower- and middle-income groups.

Universal policies that address the needs of most members of society have tended to enjoy broader public support in the long term (Lindert, 2004). Targeting schemes to people living in poverty can, by contrast, erode political support for redistribution and result in low funding (Gelbach and Pritchett, 2002).

Historically, the creation of political coalitions among groups with common interests helped garner support for redistributive policies. But coalitions that proved essential in the past may be eroding. Piketty (2018) argues that global integration and the expansion of education have diminished traditional class-based coalitions, and that new egalitarian-internationalist political platforms will be necessary to

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23 See UNDP (2019). Data are increasingly a source of economic power. Furthermore, the automatic digital records generated by digital platforms can be used to understand labour conditions, hours worked and effective compensation. This is an area of active experimentation that demands greater government involvement at different levels.

24 European regulators have been particularly proactive in monitoring potential anti-competitive practices by big tech companies. For instance, the European Commission fined Google more than 8 billion euros from 2017 to 2019 (UNDP, 2019).

25 Including 56 per cent of respondents in 10 developed countries, and just over 60 per cent in 33 developing countries and areas.

26 Two thirds of people in the Group of 20 (G20) countries distrust politicians when it comes to the tax system (IFAC and ACCA, 2019).

unite different low-income, low-education groups behind support for redistribution.

Institutions and norms that promote open and inclusive processes create conditions to reduce inequality, as do accountable governments that encourage such processes. Inclusive and participatory political institutions create checks and balances that prevent the abuse of power, and help avoid violent expressions of social discontent. Although a comprehensive account of institutional transformation is beyond the scope of this chapter, an essential first step is to actively address prejudice and discrimination.

Tackling prejudice and discrimination

Participation in economic, social and political life suffers when people lack access to essential services, employment or material resources such as income, land and housing. But it is also limited when their rights and dignity are not accorded equal respect and protection. To date, despite the 2030 Agenda's call for eliminating discriminatory laws, policies and practices, societies continue to make distinctions based on ethnicity, race, sex and other characteristics that should have no bearing on people's achievements or well-being.

Although most constitutions now enshrine the principles of equality and non-discrimination, formal discrimination persists.[27] And the impact of legislation designed to prevent discrimination in areas such as employment, education, health, housing and political participation is mixed (United Nations, 2016; Marcus, Mdee and Page, 2016), often due to inadequate enforcement.

Under the international human rights framework, affirmative action measures to favour groups that have faced discrimination are justified when they present "reasonable, objective and proportional means to address discrimination" (Committee on Economic, Social and Cultural Rights, 2009). These measures include quotas or reservations to improve the representation of women or minority ethnic groups in decision-making, quotas and scholarships to improve access to education, and preferential treatment in hiring for certain jobs.

Affirmative action policies have been effectively carried out in both developed and developing countries, especially to increase the responsiveness of governments to the needs of women and ethnic minorities (Chattopadhyay and Duflo, 2004; Beaman et al., 2012). They must be properly implemented, however, to avoid generating stigma and raising tensions among groups.[28] The preferential treatment of some groups over others has also been questioned on the grounds that it violates the principles of non-discrimination and equal protection for all.

Beyond these measures, addressing the root causes of discrimination calls for structural reforms, starting with the justice system and other national institutions. A key and basic step to promote the inclusion of disadvantaged groups is to remove obstacles to their political participation, including the right to vote. Creating an enabling environment for social movements and local associations that give disadvantaged groups a voice and agency to articulate their interests is also important. These grass-roots movements have traditionally raised and advanced issues that have subsequently

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27 In 2006, for instance, 196 ethnic or religious minorities worldwide faced some form of overt political discrimination (University of Maryland, 2015).

28 In some cases, quotas have opened opportunities only for women or members of ethnic minorities of higher socioeconomic status, while leaving those living in poverty underrepresented (Marcus, Mdee and Page, 2016).

become important priorities for governments, helping to avoid violent expressions of discontent and opening space for dialogue.

An equality lens to policymaking

Climate change, technological innovation, urbanization and other global trends can propel inequalities. It is neither possible nor desirable to hold back technological change, urbanization or demographic trends such as migration, but their effects can be managed to encourage more equitable and sustainable societies.

Megatrends call for strengthening existing policy tools and devising new ones. To reduce inequality, governments will need to anticipate the convergence of climate change and rapid urbanization by adopting land management tools that mitigate risks and applying adaptation practices that build community resilience. Innovative planning and city management are particularly urgent in poor countries given the current speed of urbanization there.

New forms of environmental taxation may be needed to advance the transition towards green economies, but must be accompanied by measures to compensate or protect the most vulnerable. They must avoid aggravating poverty and inequality by increasing prices of basic goods and services such as food, heating and transportation. Climate action and carefully designed transitions to green economies can in fact bring opportunities to reduce poverty and inequality, such as through the creation of many new jobs worldwide (ILO, 2018d).

New technologies can create new divides if part of the population does not have access or knowledge to use them, leading to job polarization and intensified wage inequality. Regulations and institutions influence the profitability of regrouping tasks into new jobs as automation is deployed, and the ability of workers to upgrade their skills to take on new responsibilities and exploit new technologies. Stronger efforts are required to bridge technological divides within and among countries, going beyond access to include broader abilities to make use of and benefit from technology. More investment should be made in skills for workers to perform new tasks over a lifetime of changing work environments. Supporting people through work and life transitions depends fundamentally on universal access to social protection.

It is also time to reconsider policies that continue to aggravate inequality, as redoubling efforts to address the root causes of inequality today will open space to manage other global trends for the benefit of all. In particular, new measures are needed to curb the consequences of financial and labour market deregulation, reduced corporate tax rates and declines in income tax progressivity.

Revitalizing multilateralism to reduce inequality

While the role of governments and other national stakeholders remains key to fighting inequality, in an interconnected world, national policymaking is increasingly constrained by the decisions of other countries and transnational firms. Multinational corporations can shop for the most favourable combination of tax incentives and other regulations, and move from one country to another when they choose. Governments have little leeway in attempts at increasing taxes. This race to the bottom leads to lower taxes, and pressure to loosen labour and environmental regulations. The process has strained tax systems around the world, weakening the ability of governments to choose and finance policies.

As a further issue, new digital goods and services produced through global processes are difficult to tax and regulate, because they are not clearly linked to physical tax jurisdictions. This can be a source of tax avoidance, profit shifting, monopoly and monopsony, all with the potential to skew the fair distribution of the fruits of innovation (UNDP, 2019). Areas of opacity in financial transactions might also favour tax avoidance, tax evasion, illicit financial flows and corruption. In an era of big data, there is a notorious lack of transparency, as highlighted by the findings of the Panama Papers and the Paradise Papers (UNDP, 2019).

International cooperation is crucial in rectifying these gaps and their links to inequalities. Significant progress in recent years has come through some multilateral initiatives such as the OECD/G20 BEPS Project, which has created internationally agreed standards to reduce profit shifting and enhance transparency, favouring the participation of developing countries. A large space for collaboration remains, however, in the reduction of loopholes to hide assets offshore, and to coordinate principles of taxation for large corporations and the digital economy (UNDP, 2019).

Cross-border trade, finance, intellectual property rights and official development assistance also affect inequality and require international cooperation. Yet at this critical time, and despite the international commitment to the 2030 Agenda and leaving no one behind, multilateralism is under attack in many countries. Trust in public institutions is lacking. Although the multilateral order could be more fit for purpose, the current world challenges call for strengthening it, rather than dismissing its value. Cooperation among countries remains essential for ensuring equitable and inclusive development – not least because the consequences of rising inequality and unsustainable growth do not respect national borders.

Evidence presented in this chapter affirms that multilateral action will be critical to address the forces driving inequality and fulfil the global social contract promised by the 2030 Agenda. Moving from commitment to action requires concerted political will from national governments, but at the same time, multilateral institutions must be fully committed to backing government efforts to reduce inequalities. Effectively supporting countries most in need in itself calls for a more inclusive multilateralism, one that gives adequate voice to all regions and stakeholders within countries.

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Annex

Matrix of megatrend interlinkages

Annex: Matrix of megatrend interlinkages

Impacts of a megatrend on other megatrends

Trend: Climate change and environmental degradation

Positive impact Negative impact

Impact on:

Emerging and frontier technologies

1. Climate change has accelerated and intensified technological innovation and policies enabling the reduction of costs in production, storage and use of renewable energy technologies, such as solar and wind.
2. Climate change has caused significant damages to supply chains, buildings and ICT infrastructure, including to adaptation technologies such as dikes and dams.

Demographic trends

1. Larger rural-urban migration flows are expected among population groups challenged by rising livelihood insecurities caused by sea-level rise, severe weather events, droughts, rising temperatures, insect infestations and water scarcity. As a result, conflict may arise or intensify in towns and cities of destination, within or among countries.
2. Climate change will exacerbate the vulnerability of countries with relatively high population growth, population density, fertility rates and reliance on rain-fed agriculture.
3. Possible increased mortality is mainly due to heat waves, epidemics, insect infestations, and the increased scale, frequency and intensity of hydrological natural hazards.

Inequalities

1. Climate change has greater impacts on less resilient population groups, including indigenous peoples and small landholders, exacerbating income insecurity and risks of infectious and respiratory diseases. This also worsens the rural-urban divide.
2. Climate change has disproportionally increased the risk of commodity-dependent developing countries and rain-fed agricultural economies by stranding their assets and resources (natural and financial), triggering crop price shocks and derailing development prospects. There is a disproportionate pressure on the fiscal balances of these countries, and shock relief is often financed through cuts to social and infrastructure spending.
3. The ratio between the income of the richest and poorest 10 per cent of the global population is 25 per cent larger than it would have been without global warming. Even with powerful mitigation and adaption strategies, between 3 million and 16 million people would fall into poverty by 2030 because of climate change; without those strategies, figures could rise to between 35 million and 122 million.
4. The contribution of commodity-dependent developing countries to greenhouse gas emissions per capita are significantly lower than those of the main emitters, widening inequalities among countries.
5. The climate change impact on people and livelihoods will likely be higher in less developed countries, while damages to infrastructure will be greater in more developed countries.
6. Climate change could reduce livelihood opportunities for future generations in the hardest-hit countries and exacerbate downward intergenerational mobility.

Urbanization

1. By driving longer, and more intense and frequent droughts, severe rains, erratic weather, floods and bushfires, climate change has become one of the main causes of economic insecurity. Larger flows of rural-urban and urban-urban migration are challenging the financial capacities of destination cities, often also affected by climatic events, to provide employment and social services. These effects have boosted unsustainable patterns of urbanization.
2. Climate change is a driver of the higher vulnerability of low-income countries in urban and rural areas. It intensifies land degradation and coastal erosion, and affects infrastructure and livelihoods through sea-level rise in low-lying areas, coastal cities and islands; ocean acidification; plastic pollution; reduction of marine biomass; heat waves; storms and floods.
3. Climate change can affect cities' institutional capacities, the built environment and the provision of ecosystem services. These effects can exacerbate the impact of resource exploitation and environmental degradation through human activities such as the removal of natural storm buffers, pollution, overuse of water and the "urban heat island" effect.

Trend: Emerging and frontier technologies

Positive impact Negative impact

Impact on:

Climate change and environmental degradation

1. Telecommuting helps to protect the environment by reducing greenhouse emissions, which improves air quality and human health.
2. Technologically driven and fossil fuel-based industry and trade have accelerated economic development, energy consumption, greenhouse gas emissions, e-waste, depletion of groundwater, land erosion, environmental degradation and climate change. The overall result has been unsustainable production, trade (e.g., shipping, zoonotic diseases) and consumption patterns.
3. Remote sensing technology can improve the efficiency of water use by more accurate measurement, helping governments to price water more appropriately and discouraging wasteful consumption. Digital technologies can improve waste-recycling rates by tracking consumer products through their life cycle – from production to disposal – and potentially by recapturing materials after consumption to take them back to the production ecosystem.
4. Vegetables transported from far distances can have smaller carbon footprints than those from shorter distances due to the use of container ships and trains that carry more volume than trucks, and use less fuel per kilo of vegetables.
5. The use of renewable energy technologies, supported by powerful battery technologies, can reduce through-put, improve efficiency in the use of natural resources (e.g., land, water, energy), and support sustainable production and consumption patterns, which would reduce greenhouse gas emissions and mitigate climate change. In this sense, flood- and drought-resistant seeds and other climate-smart agricultural technologies can reduce the impact of climate change and enhance food security, rural livelihoods and the environment.
6. Industrialization based on renewable energy technologies, such as solar and wind energy, can greatly reduce greenhouse gas emissions, mitigate climate change and support sustainable development. Technologies could also improve waste management and support the transition towards a circular economy in both rural and urban areas.
7. Monocultural farming systems and unsustainable agricultural practices such as large-scale commercial agriculture have greatly affected small-scale agriculture and livelihoods, and contributed to environmental degradation (e.g., deforestation, water scarcity, land erosion) and loss of biodiversity.
8. Artificial intelligence-based technologies use significant energy, contributing greatly to greenhouse gas emissions, climate change and environmental degradation, and heightening health risks.
9. Mining technologies and infrastructure (large dams) have adversely affected societies (e.g., livelihoods, air and water quality, health risks), forests, biodiversity and ecosystems (including rivers and ponds).

Demographic trends

1. Digital technologies can transform the "youth bulge" into a demographic dividend by supporting education and training (e.g., massive open online courses or MOOCs), financial literacy and employment, thus enabling a more productive labour force and greater well-being.
2. In many countries, technology diffusion has been uneven, creating a digital divide between populations living in rural and urban areas, and population groups within urban areas.
3. On mortality: Life-extending and other technologies can contribute to healthy ageing. The extension of working life, and changes in the social interaction and well-being of older persons are transforming what it means to be "old".
4. On fertility: Assisted reproductive technologies expand reproductive choices over the lifecycle, and new contraceptive technologies improve methods, acceptability and effectiveness.
5. Automation can enable a shrinking workforce to remain productive enough to support a larger ageing population.
6. Technologies enable faster and cheaper transport and communications, thus facilitating internal (rural to urban) and international (city to city) migration due to increased incentives to migrate and reduced costs of movement. This may be counteracted by a reduced need for movement, given better technologies for remote work.

Inequalities

1. The Internet and mobile phones enable more people in developing countries to access e-commerce and financial services. Open online courses and labour markets can help democratize access to education and employment. M-health applications and telemedicine can widen access to health-care delivery and monitoring systems, including in rural and remote areas. Data availability and e-participation through social media can enhance governance, decision-making and the participation of excluded individuals and groups.
2. Emerging and frontier technologies are benefitting highly skilled workers and hurting low- and middle-skilled workers in routine manual and cognitive tasks. Exclusive access to technologies by a few firms without strong backward and forward linkages may lead to jobless growth, excessive resource extraction and depletion of natural resources. Overall, these trends are leading to deepening inequalities within and among countries.
3. Globally, digital connectivity in urban areas is higher than rural areas as a percentage of the world population. Yet in countries where the majority of the population is urban, the number of digitally unconnected people tends to be higher in cities than in the countryside.
4. Gains from new technologies are being captured by a small number of dominant companies, leading to less demand for middle-skilled workers and intensification of wage inequality. Frontier technologies may not benefit developing countries if governments and leading firms, often located in developed countries, fail to reduce barriers to the entry and diffusion of such technologies.
5. New technologies are creating new "digital divides". For example, 87 per cent of people in developed countries have Internet access compared to 19 per cent in the least developed countries. Gaps in ICT, infrastructure, education, learning, health and skills can widen and push poorer countries and disadvantaged groups further behind.
6. Only when emerging technologies are deployed within a carefully thought-through institutional framework, including the facilitation of technology transfer, it will be possible to avoid the downside risks of further widening of inequalities, e.g., job creation/destruction, digital divides, urban/rural divides, educational/learning gaps and/or health gaps.
7. Social media and other platforms have formed isolated digital communities that reinforce confirmation biases, while algorithms have accentuated discrimination biases against vulnerable population groups, accentuating social divides.

Urbanization

1. Technological change has typically boosted urban and national productivity, created new economic activities, and lifted incomes, employment and social mobility. Telecommuting has the potential to lessen rural-urban migration flows and increase labour productivity by reducing commuting time.
2. Wider access to and the high-quality of new technologies (e.g., the Internet) have often favoured richer urban neighborhoods. Underserved neighborhoods typically cannot afford access or high-quality services. This negatively affects the use of technology for educational and health purposes, among others.
3. Diffusion and access to digital technologies (e.g., big data, machine learning) are key for improved connectivity, efficiency and reliable delivery of social services in cities and villages alike, including health care, transportation and clean forms of energy. They can also enhance monitoring and public security during pandemics.
4. The design of and investment in big data infrastructure and open data access are as important as the provision of public services in "smart" cities and villages.
5. Smart digital infrastructure can improve urban and rural development by optimizing the use of limited resources, reducing traffic congestion and greenhouse gas emissions, and facilitating connectivity and inclusive access to public services.
6. Geospatial and mapping technologies powered with artificial intelligence can help policymakers understand how the urban environment affects populations, and possible links to develop between rural and urban areas.
7. The diffusion of emerging technologies across sectors and geographies, including electric vehicles and renewable energy technologies, can reduce greenhouse gas emissions, enhance efficiency and support the building of sustainable cities and villages.
8. Technologies can intensify the application of tracking systems in both urban and rural areas, affecting peoples' privacy.

Annex: Matrix of megatrend interlinkages

Trend: Demographic trends

Positive impact Negative impact

Impact on:

Climate change and environmental degradation

1. Slower population growth can help countries buy time to invest in increasing resilience and capacities to adapt to climate change.
2. Ageing contributes moderately to increased energy consumption and global warming, especially in high-income countries.
3. Population growth contributes moderately to increased energy consumption (especially in low- and middle-income countries) and greenhouse gas emissions.
4. Other factors being equal, a smaller average household size increases carbon emissions, leading to environmental degradation.
5. Fast population growth (especially in sub-Saharan Africa and low-income countries) is an important factor in increasing food demand and agricultural production, which put pressure on scarce resources such as energy, water and land.
6. Fossil energy-based economic growth is likely to raise carbon emissions in the developing world, while the rise of the middle class continues to put upward pressure on aggregate demand and carbon emissions, even with improvements in energy efficiency.
7. Declining fertility leads to slower population growth and faster ageing. Globally, ageing could reduce future carbon dioxide emissions by up to 20 per cent by 2050.

Emerging and frontier technologies

1. Through a first demographic dividend, youthful populations represent an opportunity for mainly low-income countries to accelerate innovation, entrepreneurship, adoption of technologies and sustainable economic growth.
2. Ageing raises concerns about potential adverse consequences on innovation, labour force productivity and macroeconomic dynamism.
3. Ageing is driving increased demand for technological innovations for health care for growing numbers of older persons requiring treatment of chronic illnesses, remote diagnostic tools and automated care services.
4. The prospects of an ageing workforce in an environment of rapid technological innovation underscore the value and necessity of lifelong learning.
5. Slower population growth and, eventually, the smaller size of the working-age population (15–64 years old) incentivizes labour-augmenting technological advancement as well as immigration in more aged countries.

Inequalities

1. During the first demographic dividend, the share of the working-age population in the overall population rises, while overall dependency ratios fall, making more resources available for reducing poverty and inequalities through investments in education, health and other forms of capital.
2. For less developed regions, accelerated ageing represents a challenge to providing social protection, universal pensions, health care, retraining programmes and unemployment benefits.
3. Reduction in fertility can support greater gender equality as women spend less of their lives in childbearing and childcare roles, and have better opportunities for education and labour market participation.
4. Population ageing is likely to reduce economic inequality between countries in the long run as a growing number of countries undergo a fuller demographic transition. This is supported by a demographic dividend and progressively better educated workforce, especially in low- and middle-income countries.
5. For more developed regions, ageing is often linked to increased retirement savings and other assets, favouring capital accumulation and sustained economic growth (i.e., a second demographic dividend).
6. Smaller family sizes and increased longevity – depending on the care needs of older persons – can reduce gender equality if women remain the main caregivers for older persons.
7. Countries with rapid population growth and youthful populations face demographic pressures and challenges to provide decent work, public services and universal social protection to reduce poverty and inequalities.
8. In populations with wide swings in the age structure, there is a risk of concentrated liquidation of asset holdings later in the lifecycle. Ageing can, therefore, produce shifts in the wealth distribution and increase inequalities among countries.
9. There are higher risks of increased inequality for future retirees due to increasingly unstable labour market conditions and inequalities in both individual earnings and household incomes.

Urbanization

1. The large-scale migration of young people from rural to urban areas in developing countries challenges cities' capacities to provide affordable and sufficient food, productive employment and decent work for all. The global rate of youth unemployment was 13 per cent in 2017.
2. Ageing often raises concerns about potential consequences on the urban fiscal sustainability of transfer systems that support older persons.
3. The demographic transition eventually slows urban growth. Combined with net rural-urban migration, this can lead to the depopulation of rural areas in many high-income and some upper middle-income countries.
4. Natural population growth is the most important driver of urban population growth in many developing countries, while migration from rural to urban areas is more relevant in developed countries of Europe and the Russian Federation.

Trend: Inequalities

Positive impact Negative impact

Impact on:

Climate change and environmental degradation

1. Less inequality helps mitigate climate change. High-income countries with lower inequality consume less, produce less waste and emit less carbon than countries with higher inequality – partly due to public policies and government action, e.g., in transport and consumption. Policies to curb inequalities and climate change have to be jointly addressed to prevent backfiring, e.g., through a carbon price.
2. High and growing inequality can hinder climate action to mitigate or reduce environmental degradation due to economic and political pressures to maintain the status quo.
3. Inequalities among countries in the tropics and countries in more temperate zones have heightened the adverse impacts of climate change on food security and livelihoods.
4. Populations suffering poverty and with no access to modern energy depend on cutting trees to produce charcoal, which is used to cook food and heat houses, but leads to soil and biodiversity degradation and respiratory diseases.
5. Higher inequality prompts greater pollution, which heightens the adverse impacts of climate change.

Emerging and frontier technologies

1. Reducing the technological divide between countries implies combined efforts of both indigenous and foreign innovation systems to reap the benefits of technology diffusion. Less technologically advanced countries would have to upgrade industrial, technology and trade policies as well as institutional structures.
2. Social and economic inequalities in less technologically advanced countries can slow the transfer of new technologies. They can also hinder the production, application and diffusion of technologies within countries, some of which can help mitigate climate change and reduce environmental degradation.
3. Investment in technological and social infrastructure favouring underserved populations in rural and urban areas have eliminated various technological divides within countries.
4. Higher inequality reduces the ability of countries to invest in science and technology, and take advantage of the potential of technology, innovation and human capacities.

Demographic trends

1. Inequality can spur migration within and across international borders due to inadequate working conditions and remuneration, and livelihood insecurities. Yet well-managed and orderly migration that fully respects migrants' human rights can be positive for the economies of origin and destination.
2. Inequalities affect trends in fertility. In developing countries, persistent socioeconomic inequality delays the demographic transition. In developed countries, varying degrees of inequality may translate into a bifurcation of shrinking versus stabilized populations.
3. Inequality-reducing public education is strongly associated with lower fertility and increased longevity.
4. Inequality in adolescent fertility can reproduce an intergenerational cycle of poverty and inequality.
5. Inequalities increase mortality by slowing population-levelling gains to the extent that lower socioeconomic strata lag behind at higher mortality rates.

Urbanization

1. Lower urban inequalities can improve educational and health outcomes, fostering higher productivity, innovation, green economic growth and social cohesion. Overall lower health risks and the lessened probability of conflict can be co-benefits.
2. If not well managed, rising inequalities can weaken trust and workers' rights, and heighten social and political insecurities within countries. This can lead to larger flows of forced internal and international migration to cities and, ultimately, can possibly intensify conflict.
3. Inequality increases the likelihood of severe food insecurity in urban and rural areas, hindering efforts to eradicate hunger and malnutrition. The prevalence of severe food insecurity is almost three times higher in countries with high income inequality (21 per cent) compared with countries with low income inequality (7 per cent).
4. Higher inequalities can reduce effective demand and economic growth, weaken workers' rights and feed informal employment in cities. This increases fiscal pressure to provide social services to vulnerable populations, including assistance during and after "natural" disasters.
5. Economic inequalities play a significant role in determining access to nutrition, education and health care in urban and rural areas. In many countries, stunting prevalence among children under 5 years old is 2.5 times higher in the lowest wealth quintile compared with the highest wealth quintile. Further, the lower the mother's education, the higher the likelihood of a stunted child .

Positive impact Negative impact

Trend: Urbanization

Impact on:

Climate change and environmental degradation

1. Building sustainable cities implies the use of renewable energy, which reduces greenhouse gas emissions and mitigates climate change. More broadly, cities are uniquely positioned to drive a transition from a linear economy towards a circular economy due to their high concentration of resources, capital, data and talent, which can reduce energy intensity and waste, and improve the environment.
2. Business-as-usual urbanization has shifted production activities undertaken in rural households with little energy to outside energy-intensive producers, speeding up fossil-based energy consumption due to higher population density, use of electricity, food processing, transportation and public services. This trend outpaces the transition to clean energy; as a result, greenhouse gas emissions, global warming and air pollution have risen (two-thirds of global energy consumption comes from cities).
3. Investment in urban adaptation strategies can reduce the adverse impacts of climate change and enhance the resilience of vulnerable populations.
4. By developing buildings, roads and footpaths, and urban land surfaces, and through activities producing pollutants, cities have changed the behaviour of precipitation-surface runoff and degraded water quality in receiving waters, endangering the environment and human health.
5. Urbanization has produced adverse impacts in terms of land cover (e.g., human-made structures) and land use (e.g., use and exploitation of land cover), and depleted natural resources such as water from rivers and oceans, intensifying the degradation of the environment and biodiversity.
6. Urbanization is the main driver of land-use change and food loss and waste at production, distribution, retail and consumption phases (e.g., construction and demolition waste). This heightens environmental degradation and health risks by releasing greenhouse gas emissions in the production cycle, increasing waste and spurring the rise of zoonotic diseases.
7. Lifestyle changes that accompany urbanization include changes in diets, usually towards non-grain products (e.g. meat, vegetables, fish, milk), which intensify the use of natural resources and unsustainable patterns of food production and consumption.
8. High-income individuals residing in the outskirts of cities (e.g., urban sprawl) tend to produce higher greenhouse gas emissions per capita (carbon footprint) due to higher use of private transportation and infrastructure built for smaller households and estates typically distant from each other.
9. Increased urbanization can intensify extreme rainfall events over cities, in particular due to the effect of aerosol emissions on rainfall.

Emerging and frontier technologies

1. Urban agglomerated economies facilitate the clustering of industrial sectors that enhance incomes, efficiency, knowledge and learning spillovers that are important for the diffusion of technology, innovation and digital connectivity.
2. Urbanization has put a heavy stress on housing, sanitation, transportation, water, electricity, health and educational infrastructure capacities.
3. Cities can organize and facilitate the mobility of goods and services by providing a better layout, which helps broaden the use of technologies and increase the efficiency of value supply chains.
4. Cities provide more opportunities to invest in infrastructure, including for health systems, transportation, ICT and education, which fosters economic concentration and large-scale markets.

Demographic trends

1. Rapid and well-managed urbanization speeds up the demographic transition due to lower fertility and mortality than in rural areas, contributing to smaller family sizes over time. Family planning methods and health-care systems are likely to be more efficiently available in urban areas.
2. In many cities, the urbanization process has led to relative depopulation of rural areas and, subsequently, of the city centre. As a result, steady growth of peri-urban areas has occurred.
3. Urbanization typically drives rural-urban migration as well as migration from smaller to bigger (global) cities, in other words, urban-urban migration.
4. The excess demand for labour in quite urbanized and aged societies is a major driver of international migration as well as of discrimination and abuse against migrants.

Inequalities

1. Sustainable urban governance, planning and design are key to building resilient cities and circular economies, and reducing inequalities. Sustainable cities encompass inclusive access to education, health care, decent work, resilient housing, green transportation, ICT and finance among marginalized populations and small and medium enterprises.
2. Many cities and towns have high levels of wealth and modern infrastructure that coexist with poverty, and inadequate and expensive social services. In fact, the absolute number and share of the urban poor in the total impoverished population have increased. The share is expected to reach 50 per cent by 2030.
3. Expensive land, housing and water as well as poor urban planning can concentrate disadvantages in residential locations such as slums, leading to a vicious cycle of the exclusion and marginalization of, for example, migrants and homeless people. In 2016, over 1 billion people (one in four urban residents) lived in slums.
4. Cities are catalysts for economic growth, innovation and employment, yet urban areas are often more unequal than rural areas. There is a need for more balanced development between and within rural and urban areas.
5. Although maternal and child health care are often better in urban than in rural areas, they can be worse in urban slums and underserved neighbourhoods than in rural areas.
6. Urban areas offer market opportunities to poor farmers in rural areas.
7. Urbanization often leads to the reduction of gender inequalities by prioritizing women's education. In contexts where land-based activities (e.g., arable cropping, livestock husbandry and collection of wild products) are key components of urban livelihoods, there are lower gender differences in labour participation along the urbanization gradient, e.g., peri-urban, urban.
8. Growth in demand for processed foods in urban areas, often with lower nutrient value than fresh food, has led to child undernutrition, micronutrient deficiencies, and greater number of overweight people and diet-related diseases, particularly in underserved neighbourhoods.
9. More capital-intensive, vertically integrated, concentrated and expensive food chains have heightened food and income insecurities for small-scale producers, the underemployed and people living in informal settlements (e.g., migrants).

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References

Chapter 2

Aguilar, G. (2001). Access to genetic resources and protection of traditional knowledge in the territories of indigenous peoples, *Environmental Science & Policy*, vol. 4, No. 4-5.

Alkire, S., F. Kovesdi, C. Mitchell, M. Pinilla-Roncancio and S. Scharlin-Pettee. (2020). *Changes over Time in the Global Multidimensional Poverty Index.* OPHI MPI Methodological Note 50. Oxford, United Kingdom: University of Oxford, Oxford Poverty and Human Development Initiative.

Assad, E., H. S. Pinto, A. Nassar, L. Harfuch, S. Freitas, B. Farinelli, M. Lundell and E. C. Fernandes (2013). Impacts of climate change on Brazilian agriculture. Washington, D.C.: World Bank.

Baldwin, R., and B. Weder di Mauro, eds. (2020). *Economics in the time of COVID-19.* London: CEPR Press.

Berman, J. D., and K. Ebisu (2020). Changes in U.S. air pollution during the COVID-19 pandemic, *Science of the Total Environment*, vol. 739, No. 139864.

Cheng, Z., and others (2016). Status and characteristics of ambient PM2.5 pollution in global megacities, *Environment International*, 89-90. doi: 10.1016/j.envint.2016.02.003.

Convention on Biological Diversity, Secretariat of (CBD) (2013). Biodiversity is key to sustainable, efficient, resilient and nutritious food production. Biodiversity for Food Security and Nutrition, 5 July. Available from https://www.cbd.int/doc/newsletters/development/news-dev-2015-2013-07-en.pdf.

——— (2018a). Analysis of the contribution of targets established by parties and progress towards the Aichi biodiversity targets. Available from www.cbd.int/doc/c/e24a/347c/a8b84521f326b90a198b1601/sbi-02-02-add2-en.pdf. Accessed on 21 June 2020.

——— (2018b). Updated assessment of progress towards selected Aichi biodiversity targets and options to accelerate progress. Available from www.cbd.int/doc/c/3824/7957/5bb56cbf504e73b6f00282e9/cop-14-l-02-en.pdf.

Dasgupta, P. (2015). Disregarded capitals: what national accounting ignores, *Accounting and Business Research*, vol. 45, No. 4, pp. 447-464. doi: 10.1080/00014788.2015.1033851.

Dasgupta, P., and A. Duraiappah (2012). Well-being and wealth, *IHDPUNU-UNEP Inclusive Wealth Report 2012*. Cambridge, United Kingdom: Cambridge University Press.

Despommier, D., B. R. Ellis and B. A. Wilcox (2006). The Role of Ecotones in Emerging Infectious Diseases, *EcoHealth,* vol. 3, pp. 281-289. doi: 10.1007/s10393-006-0063-3.

Economic and Social Commission for Asia and the Pacific (UNESCAP) (2018). Inequality in Asia and the Pacific in the era of the 2030 Agenda for Sustainable Development. Bangkok.

——— (2019). *Asia-Pacific Disaster Report 2019.* Available from www.unescap.org/publications/asia-pacific-disaster-report-2019.

Economics of Land Degradation (ELD) Initiative (2015). *Report for policy and decision makers: Reaping economic and environmental benefits from sustainable land management.* Available from www.eld-initiative.org.

Engel, H., and others (2020). How a Post-Pandemic Stimulus Can Both Create Jobs and Help the Climate. McKinsey & Company. 27 May. Available from www.mckinsey.com/business-functions/sustainability/our-insights/how-a-post-pandemic-stimulus-can-both-create-jobs-and-help-the-climate#.

Farley, J. (2012). Ecosystem services: The economics debate. *Ecosystem Services,* vol. 1, pp. 40-49.

Food and Agriculture Organization of the United Nations (FAO) (2016). Commercial agriculture accounted for almost 70 percent of deforestation in Latin America. Available from http://www.fao.org/americas/noticias/ver/en/c/425600/.

Frankfurt School-United Nations Environment Programme Centre (2019). Global Trends in Renewable Energy Investment 2019. Available from www.fs-unep-centre.org.

Global Sustainable Development Report (GSDR) (2019). The Future is Now: Science for Achieving Sustainable Development. Independent Group of Scientists appointed by the Secretary-General. Available from https://sustainabledevelopment.un.org/globalsdreport/2019.

Hasselström, L., and others (2018). The impact of seaweed cultivation on ecosystem services – a case study from the west coast of Sweden, *Marine Pollution Bulletin*, vol. 133, pp. 53-64.

Hein, L., and others (2020). Progress in natural capital accounting for ecosystems, *Science*, vol. 367, no. 6477, pp. 514-515. doi: 10.1126/science.aaz8901.

Intergovernmental Panel on Climate Change (IPCC) (2007). *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

——— (2013). *AR5 WG. Climate Change 2013: The Physical Science Basis – Anthropogenic and Natural Radiative Forcing Supplementary Material.* Cambridge, United Kingdom: Cambridge University Press.

——— (2014). Climate Change 2014: Mitigation of Climate Change, Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Summary for Policymakers. O. Edenhofer and others, eds. Cambridge and New York: Cambridge University Press.

——— (2018). Global Warming of 1.5°C. Available from www.ipcc.ch/sr15/.

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (2019). *Global Assessment Report on Biodiversity and Ecosystem Services.* Available from https://ipbes.net/global-assessment-report-biodiversity-ecosystem-services.

International Food Policy Research Institute (IFPRI) (2016). 2016 Global Food Policy Report. Washington, D.C.

International Monetary Fund (IMF) (2020). Policy Responses to COVID19. Washington, D.C. Available from www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19.

International Organization for Migration (IOM) (2014). Outlook on Migration, Environment and Climate Change, 2014. Geneva.

International Resource Panel (IRP) (2019). Mineral Resource Governance in the 21st Century: Gearing extractive industries towards sustainable development. E. T. Ayuk and others, eds. Nairobi: United Nations Environment Programme.

Jones, B. A., and others (2013). Zoonosis emergence linked to agricultural intensification and environmental change, *Proceedings of the National Academy of Science,* vol. 110, no. 21, pp. 8399-8404.

Lawson, S., and others (2014). Consumer Goods and Deforestation: An Analysis of the Extent and Nature of Illegality in Forest Conversion for Agriculture and Timber Plantations, *Forest Trends* (September).

Leaton, J., and others (2013). Unburnable carbon 2013: Wasted capital and stranded assets. London: Carbon Tracker and The Grantham Research Institute.

Managi, S., and P. Kumar, eds. (2018). *Inclusive Wealth Report 2018: Measuring Progress Towards Sustainability.* Oxford: Routledge Taylor and Francis Group.

Mccormick, K. (2020). Cities, Nature and Innovation: New Directions, *Urban Nature Compendium*. Lund University. Available from portal.research.lu.se/portal/files/75255308/Urban_Nature_Compendium.pdf.

Nasi, R., and others (2008). Conservation and use of wildlife-based resources: the bushmeat crisis, *CBD Technical Series,* No. 33.

Organisation for Economic Co-operation and Development (2016). The economic consequences of outdoor air pollution: Policy Highlights. Paris. Available from www.oecd.org/environment/indicators-modelling-outlooks/Policy-Highlights-Economic-consequences-of-outdoor-air-pollution-web.pdf.

——— (2018). International Trade and the Transition to a Circular Economy: OECD Policy Highlights. Paris. Available from www.oecd.org/environment/waste/policy-highlights-international-trade-and-the-transition-to-a-circular-economy.pdf.

Sato, T., and others (2013). Global, regional, and country level need for data on wastewater generation, treatment, and use, *Agricultural Water Management,* vol. 130, pp 1-13.

Seager, J. (2014). Background and Methodology for Gender Global Environmental Outlook. Nairobi: United Nations Environment Programme. Available from https://web.unep.org/sites/default/files/ggeo/documents/GGEO_Multi-stakehoder_consultation_Background_document_final.pdf.

Svobodova, M., and others (2004). Heteroxenous coccidia (Apicomplexa: Sarcocystidae) in the populations of their final and intermediate hosts: European buzzard and small mammals, *ACTA Portozoologica*, vol. 43, pp. 251-260.

Taki, H., and others (2011). Plantation vs. natural forest: Matrix quality determines pollinator abundance in crop fields, *Scientific Reports,* vol. 1, p. 132.

United Nations (2005). International Workshop on Traditional Knowledge: Biodiversity, Traditional Knowledge and Rights of Indigenous Peoples, Panama City, 21-23 September. IPRs Series No. 5. Available from www.un.org/esa/socdev/unpfii/documents/workshop_TK_taulicorpuz.pdf. Accessed on 23 June 2020.

United Nations Conference on Trade and Development (UNCTAD) (2019a). *Commodity Dependence, Climate Change, and the Paris Agreement: Commodities and Development Report 2019*.

——— (2019b). The Impact of Rapid Technological Change on Sustainable Development. Commission on Science and Technology for Development, March. Available from unctad.org/meetings/en/SessionalDocuments/ecn162019d2_en.pdf.

United Nations Convention to Combat Desertification (UNCCD) (2015). Achieving Land Degradation Neutrality. Available from www.unccd.int/actions/achieving-land-degradation-neutrality.

——— (2019). Land Degradation Neutrality for Biodiversity Conservation: How healthy land safeguards nature, 2019. Available from http://catalogue.unccd.int/1340_LDN_BiodiversityGM_Report.pdf.

United Nations, Department of Economic and Social Affairs (UNDESA) (2017). Climate Change and Social Inequality, DESA Working Paper No. 152S T/ESA /2017/DWP/152. New York.

United Nations Environment Programme (UNEP) (2016a). Frontiers 2016 Report: Emerging Issues of Environmental Concern. Nairobi.

——— (2016b). *Global Gender and Environment Outlook*. Nairobi. Available from wedocs.unep.org/bitstream/handle/20.500.11822/14764/Gender_and_environment_outlook_HIGH_res.pdf?sequence=1&isAllowed=y.

——— (2016c). Sustainable management of natural capital for sustainable development and poverty eradication. UNEP/EA.2/Res. 13. Available from wedocs.unep.org/bitstream/handle/20.500.11822/11188/K1607246_UNEPEA2_RES13E.pdf?sequence=1&isAllowed=y.

——— (2019a). *Emissions Gap Report 2019: Global progress report on climate action.* Available from https://www.unenvironment.org/interactive/emissions-gap-report/2019/.

——— (2019b). Frontiers 2018/19 Emerging Issues of Environmental Concern. Nairobi.

——— (2019c). Global Environment Outlook 6. Nairobi. Available from www.unenvironment.org/resources/global-environment-outlook-6.

——— (2019d). Global Environment Outlook 6: Summary for Policymakers. Available from https://wedocs.unep.org/handle/20.500.11822/27652.

——— (2019e). *Inclusive Wealth Report 2018.* Nairobi. Available from www.unenvironment.org/resources/report/inclusive-wealth-report-2018

——— (2019f). *Global Chemicals Outlook II (2019): From Legacies to Innovative Solutions – Implementing the 2030 Agenda for Sustainable Development.* UNEP/EA.4/21. Available from https://papersmart.unon.org/resolution/uploads/k1900123.pdf#overlay-context=pre-session-unea-4.

——— (2020). What does the UN Environment Programme bring to the table in the zero-budget natural farming debate? Available from www.unenvironment.org/news-and-stories/story/what-does-un-environment-programme-bring-table-zero-budget-natural-farming.

United Nations Environment Programme and the International Waste Management Association (2016.). *Global Waste Management Outlook, 2015.* Available from www.unenvironment.org/resources/report/global-waste-management-outlook.

United Nations Industrial Development Organization (UNIDO) (2017). Circular Economy, 2017. Vienna.

The World Bank (2020). Planning for the economic recovery from COVID-19: A sustainability checklist for policymakers, World Bank Blogs. Available from https://blogs.worldbank.org/climatechange/planning-economic-recovery-covid-19-coronavirus-sustainability-checklist-policymakers.

World Economic Forum (2019). Global Battery Alliance, 2019. Available from www3.weforum.org/docs/WEF_GBA_Overview_2019.pdf.

——— (2020a). COVID-19 and nature are linked. So should be the recovery. Available from www.weforum.org/agenda/2020/04/covid-19-nature-deforestation-recovery/. Accessed on 23 June 2020.

——— (2020b). *Global Risks Report 2020.* Available from https://reports.weforum.org/global-risks-report-2020/save-the-axolotl/.

Zambrano-Monserrate, M. A., M. A. Ruano and L. Sanchez-Alcalde (2020). Indirect effects of COVID-19 on the environment, *Science of the Total Environment,* vol. 728, No. 18813.

Chapter 3

Bartel, A. P., and N. Sicherman (1993). Technological Change and Retirement Decisions of Older Workers, *Journal of Labor Economics*, vol. 11, No. 1, pp. 162-83.

Basso, G., G. Peri and A. Rahman (2018). The impact of immigration on wage distributions in the era of technical automation. Vox CEPR Policy Portal. Available from https://voxeu.org/article/immigration-era-automation.

Behohlav, K. (2016). Investing in women and girls for a gender dividend. Washington, D.C.: Population Reference Bureau. Available from www.prb.org/investing-women-girls-gender-dividend/.

Blanco, G., and others (2014). Drivers, Trends and Mitigation. In *Climate Change 2014: Mitigation of Climate Change, Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. O. Edenhofer and others, eds. Cambridge and New York: Cambridge University Press.

Bloom, D., and others (2003). *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*. RAND Corporation.

Bongaarts, J., and B. C. O'Neill (2018). Global warming policy: Is population left out in the cold? *Science,* vol. 361, No. 6403 (17 August).

Canning, D., and T. P. Schultz (2012). The economic consequences of reproductive health and family planning, *The Lancet*, vol. 380, No. 9837, pp. 165-171. doi:10.1016/S0140-6736(12)60827-7.

Case, A., and A. Deaton (2017). Mortality and Morbidity in the 21st Century, *Brookings Papers on Economic Activity* (Spring), pp. 387-452

——— (2020). *Deaths of Despair and the Future of Capitalism*. Princeton, NJ: Princeton University Press.

Dasgupta, A., V. Kantorová and P. Ueffing (2020). The impact of the COVID-19 crisis on meeting needs for family planning: a global scenario by contraceptive methods used, *Gates Open Research*, vol. 4, No. 102. doi: 10.12688/gatesopenres.13148.1.

De Henau, J., and others (2019). Investing in Free Universal Childcare in South Africa, Turkey and Uruguay. UN Women Discussion Paper Series No. 28. New York: UN Women.

Finlay, J., M. Norton and I. Mejia (2017). Adolescent fertility and child health, *International Journal on Child Health and Nutrition,* vol. 6, No. 1, pp. 16-33.

Finlay, J., I. Mejia and Y. Akachi (2018). Inequality in total fertility rates and the proximate determinants of fertility in 21 sub-Saharan African countries, *PLOS One* (18 September). Available from https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0203344.

Fürnkranz-Prskawetz, A. (2008). Population aging and future carbon emissions in the United States, *Energy Economics*, vol. 30, No. 2, pp. 642-675.

Gaetano, B., G. Peri and A. Rahman (2018). The impact of immigration on wage distributions in the era of technical automation. Vox CEPR Policy Portal. Available from https://voxeu.org/article/immigration-era-automation.

Gelb, S., and A. Krishnan (2018). Technology, Migration and the 2030 Agenda for Sustainable Development. Briefing note (September). London: Overseas Development Institute. Available from www.odi.org/sites/odi.org.uk/files/resource-documents/12395.pdf.

Goldstein, J. and R. D. Lee (2014). How large are the effects of population aging on economic inequality? Vienna Yearbook of Population Research, Vol. 12, Special issue on Health, education and retirement over the prolonged life cycle (2014), pp. 193-209 (17 pages). Published By: Austrian Academy of Sciences Press. DOI: 10.2307/43773391, https://www.jstor.org/stable/43773391.

——— (2020). Demographic Perspectives on Mortality of Covid-19 and Other Epidemics. PNAS first published August 20, 2020 https://doi.org/10.1073/pnas.2006392117.

Goldstein, J., and R. D. Lee (2020). Demographic Perspectives on Mortality of Covid-19 and Other Epidemics. Manuscript.

Gratton, L., and A. Scott (2016). *The 100-Year Life: Living and Working in the Age of Longevity.* Bloomsbury Publishing. Available from www.100yearlife.com/the-book/.

Herrmann, M. (2015). Consequential omissions: How demography shapes development – lessons from the MDGs for the SDGs. New Security Beat, Wilson Center. Available from https://www.newsecuritybeat.org/2015/04/consequential-omissions-demography-shapes-development/.

Hippe, R., and F. Perrin (2018). Gender equality in human capital and fertility in the European regions in the past, *Investigaciones de Historia Económica*, vol. 13, No. 3 (October), pp. 166-179.

International Labour Organization (ILO) (2018). Care work and care jobs for the future of decent work. Geneva. Available from www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_633135.pdf.

——— (2020). Skills and migration. Available from www.ilo.org/global/topics/labour-migration/policy-areas/skills-migration/lang--en/index.htm.

International Organization for Migration (IOM) (2020). Migration forecasting. Available from https://migrationdataportal.org/themes/migration-forecasting.

Lee, R., and A. Mason (2006). What Is the Demographic Dividend? *Finance and Development*, vol. 43, No. 3 (September).

Lee, R., and Y. Zhou (2017). Does Fertility or Mortality Drive Contemporary Population Aging? The Revisionist View Revisited, *Population and Development Review,* vol. 32, No. 2, pp. 285-30.

Lloyd, D. (2018). 21st Century Skills for Older Workers. The Oxford Institute of Population Ageing. Available from www.ageing.ox.ac.uk/blog/skills-for-older-workers.

Lomazzi, V., and others (2019). Gender Equality in Europe and the Effect of Work-Family Balance Policies on Gender-Role Attitudes, *Social Science*s, vol. 8, No. 5. doi: 10.3390/socsci8010005.

Lovasz, A., and M. Rigó (2013). Vintage effects, aging and productivity, *Labour Economics*, vol. 22, pp. 47–60. doi: 10.1016/j.labeco.2012.08.005.

Lutz, W., and others (2017). *World Population and Human Capital in the Twenty-First Century.* Oxford, United Kingdom: Oxford University Press.

Mason, A., and others (2017). Support Ratios and Demographic Dividends: Estimates for the World, United Nations Department for Economic and Social Affairs, Population Division, Technical Paper 2017/1.

Miller, T., P. Saad and C. Martínez (2016). Population Ageing, Demographic Dividend and Gender Dividend: Assessing the Long Term Impact of Gender Equality on Economic Growth and Development in Latin America. In *Demographic Dividends: Emerging Challenges and Policy Implications. Demographic Transformation and Socio-Economic Development*, vol. 6. R. Pace and R. Ham-Chande, eds. Springer. doi: 10.1007/978-3-319-32709-9_2.

Mosbah, A., and others (2019). Migrants in the High-Tech and Engineering Sectors: An Emerging Research Area. Conference paper, 2018 IEEE Conference on Systems, Process and Control. Available from www.researchgate.net/publication/332824610_Migrants_in_the_High-Tech_and_Engineering_Sectors_An_Emerging_Research_Area.

National Research Council (1999). *Critical Perspectives on Schooling and Fertility in the Developing World*. Washington, D.C.: The National Academies Press.

O'Neill, B. C., and others (2012). Demographic change and carbon dioxide emissions, *The Lancet*, vol. 380, pp. 157-164.

Organisation for Economic Co-operation and Development (OECD) (2019). *Pensions at a Glance 2019: OECD and G20 Indicators.* Paris: OECD Publishing. doi: 10.1787/b6d3dcfc-en.

Pantelides, E. A., and G. Binstock (2007). La fecundidad adolescente en la Argentina al comienzo del Siglo XXI, *Revista Argentina de Sociología,* vol. 5, Núm. 9 (noviembre-diciembre), pp. 24-43.

Park, D. C. (2019). Cognitive ability in old age is predetermined by age 20 y, *PNAS,* vol. 116, No. 6, pp. 1832-1833. doi: 10.1073/pnas.1821142116.

Piketty, T. (2014). *Capital in the Twenty-First Century.* Cambridge, MA: Harvard University.

Rodríguez Vignoli, J. (2007). América Latina y el Caribe. Pobreza y población: enfoques, conceptos y vínculos con las políticas públicas. Notas de Población, Naciones Unidas Comisión Económica para América Latina y el Caribe.

Sitruk-Ware, R. and others (2012). Contraception technology: past, present and future. Available from www.contraceptionjournal.org/article/S0010-7824(12)00729-9/fulltext.

Skirbekk, V. (2016). Ageing, health and work potential. Presentation at the United Nations Expert Group Meeting on Changing Age Distributions and Sustainable Development, New York (13-14 October).

Skirbekk, V. and others (2018). How to Measure Population Aging? The Answer Is Less than Obvious: A Review, *Gerontology* (December).

Staab, S. (2016). Gender equality, child development and job creation: How to reap the 'triple dividend' from early childhood education and care services. UN Women Policy Brief No. 2. New York: UN Women.

United Nations (2015). *The World's Women 2015: Trends and Statistics.* New York.

——— (2017a). Changing population age structures and sustainable development. Report of the Secretary-General prepared for the 50th session of the Commission on Population and Development. E/CN.9/2017/2. New York.

——— (2017b). Monitoring of population programmes, focusing on changing population age structures and sustainable development, in the context of the full implementation of the Programme of Action of the International Conference on Population and Development. E/CN.9/2017/3. New York.

——— (2017c). World Population Ageing 2017: Highlights. ST/ESA/SER.A/397. New York.

——— (2019a). How certain are the United Nations global population projections? *Population Facts* 2019/6 (December). Available from www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2020/Apr/un_2019_factsheet6.pdf. New York.

——— (2019b). World Population Ageing 2019: Highlights. New York.

——— (2019c). World Population Prospects 2019: Highlights. ST/ESA/SER.A/423. New York.

——— (2020a). *Estimates and Projections of Family Planning Indicators 2020.* New York. Available from www.un.org/en/development/desa/population/theme/family-planning/cp_model.asp.

——— (2020b). *World Population Ageing 2019.* ST/ESA/SER.A/444. New York.

United Nations, Department of Economic and Social Affairs (UNDESA) (2017). Climate Change and Social Inequality, DESA Working Paper No. 152S T/ESA /2017/DWP/152. New York.

United Nations, International Organization for Migration (IOM) and Organisation for Economic Co-operation and Development (OECD) (2019). SDG Indicator 10.7.2: Number of countries with migration policies to facilitate orderly, safe, regular and responsible migration and mobility of people. Policy Brief 1 (October).

UN Women (2019). *Progress of the World's Women: Families in a Changing World*. New York: UN Women. Available from www.unwomen.org/-/media/headquarters/attachments/sections/library/publications/2019/progress-of-the-worlds-women-2019-2020-executive-summary-en.pdf?la=en&vs=3513.

The World Bank and International Monetary Fund (IMF) (2016). *Global Monitoring Report 2015-16: Development in an Era of Demographic Change*. Washington, D.C.: The World Bank and IMF.

Zagheni, E. (2011). The Leverage of Demographic Dynamics on Carbon Dioxide Emissions: Does Age Structure Matter? *Demography*, vo. 48, pp. 371-399. Available from https://link.springer.com/article/10.1007/s13524-010-0004-1.

Zhu, Y. (2017). The urban transition and beyond: Facing new challenges of the mobility and settlement transitions in Asia. Paper presented at the United Nations Expert Group Meeting on Sustainable Cities, Human Mobility and International Migration, DESA, New York (7-8 September).

Chapter 4

African Development Bank (2018). *African Economic Outlook 2018*. Abidjan.

African Development Bank (AfDB), Organisation for Economic Co-operation and Development (OECD) and United Nations Development Programme (UNDP) (2016). *African Economic Outlook 2019*. Paris: OECD Publishing.

Alexandratos, N., and J. Bruinsma (2012). *World agriculture towards 2030/2050: the 2012 revision.* ESA Working Paper No. 12-03. Rome: FAO. Available from www.fao.org/docrep/016/ap106e/ap106e.pdf.

Ali, H., and others (2015). Causes and effects of rural-urban migration in rural areas of Khyber Pakhtunkhwa-Pakistan, *Arts and Social Sciences Journal*, vol. 6, No. 5, pp. 1-6.

Australia, Department of Sustainability (2012). Biosolids snapshot. Canberra.

Barret, C. B., and others (2017). On the Structural Transformation of Rural Africa. Policy Research Working Paper 7938. Washington, D.C.: The World Bank.

Beegle, K., and others (2016). *Poverty in a Rising Africa*. Washington, D.C.: World Bank.

Castells-Quintana, D., and H. Wenban-Smith (2019). Population Dynamics, Urbanization without Growth, and the Rise of Megacities, *The Journal of Development Studies*. Doi: 10.1080/00220388.2019.1702160.

CBInsights (2018). We Analyzed 6 E-Commerce Brands Breaking into Brick-and-Mortar to Understand the Secrets to Their Success — Here's What We Learned. Available from www.cbinsights.com/research/online-offline-retail-ecommerce-brick-and-mortar/.

Chamie J. (2020). As Cities Grow, So Do the Numbers of Homeless. Yale Global Online. New Haven, CT: Yale University. Available from https://yaleglobal.yale.edu/content/cities-grow-so-do-numbers-homeless.

Charles, A., H. Galal and D. Guma (2018). *Preparing Cities to Manage Migration*. Available from www.pwc.com/gx/en/issues/assets/pdf/preparing-cities-manage-migration.pdf.

Cities Alliance (2020). Why do we need cities for women? Brussels. Available from www.citiesalliance.org/how-we-work/our-programmes/global-programmes/cities-for-women.

Commission on Social Development (2020). *Outcome Document on Homelessness and Affordable Housing.* New York: Commission on Social Development.

Cunliff, C. (2019). *Omission Innovation 2.0: Diagnosing the Global Clean Energy Innovation System.* Information Technology and Innovation Foundation.

Dodman, D., and others (2013). Understanding the nature and scale of urban risk in low- and middle-income countries and its implications for humanitarian preparedness, planning and response. Human Settlements Discussion Paper Series, Climate Change and Cities 4. London: International Institute for Environment and Development.

Earle, L. (2016). Urban crises and the new urban agenda, *Environment and Urbanization*, vol. 28, No. 1, pp. 77-86.

Ellen Macarthur Foundation (2017a). Cities in the circular economy: an initial exploration. Cowes, United Kingdom.

——— (2017b). "Urban Bio-Cycles". Cowes, United Kingdom.

——— (2019). City governments and their role in enabling a circular economy transition: an overview of urban policy levers. Cowes, United Kingdom.

——— (2020). Cities and the Circular Economy. Cowes, United Kingdom. Available from www.ellenmacarthurfoundation.org/explore/cities-and-the-circular-economy.

English, T. (2016). Local Motors Creates Electric Autonomous Car that Drives with IBM's Watson. Interesting Engineering (18 June). Available from https://interestingengineering.com/local-motors-creates-electricautonomous-car-drives-ibms-watson.

Esposito, M., T. Tse and K. Soufani (2017). Is the Circular Economy a New Fast-Expanding Market?, *Thunderbird International Business Review,* vol. 59, pp. 9-14.

European Commission and others (2020). A recommendation on the method to delineate cities, urban and rural areas for international statistical comparisons. Background document for the Statistical Commission, fifty-first session (3-6 March). Available from https://unstats.un.org/unsd/statcom/51st-session/documents/BG-Item3j-Recommendation-E.pdf.

European Union (2016). Pathways to a circular economy in cities and regions: A policy brief addressed to policy makers from European cities and regions. Lille, France.

Farrell, K. (2017). The rapid urban growth triad: a new conceptual framework for examining the urban transition in developing countries, *Sustainability*, vol. 9, No. 8, p. 1407.

Fischer, R. (2011). *Rural-Urban Migration. A necessity to survive*. GRIN Verlag.

Fleming, A., and A. Tranovich (2016). Why Aren't We Designing Cities that Work for Women, Not Only Men?, *The Guardian* (13 October). Available from www.theguardian.com/global-development-professionals-network/2016/oct/13/why-arent-we-designing-cities-that-work-for-women-not-just-men. Accessed on 18 March 2020.

Fletcher, T. D., H. Andrieu and P. Hamel (2013). Understanding, management and modelling of urban hydrology and its consequences for receiving waters: a state of the art, *Advances in Water Resources,* vol. 51, pp. 261-279.

Food and Agriculture Organization of the United Nations (FAO) (2007). *Profitability and sustainability of urban and peri-urban agriculture*. Rome.

——— (2011). *The place of urban and peri-urban agriculture (UPA) in national food security programmes*. Rome.

——— (2013). Food Wastage Footprint: Impacts on Natural Resources. Summary report. Rome. Available from www.fao.org/3/i3347e/i3347e.pdf.

——— (2017). *Save Food for a Better Climate – Converting the food loss and waste challenge into climate action*. Rome: FAO.

——— (2018a). *Food loss and waste and the right to adequate food: making the connection*. Rome.

——— (2018b). *2018 The State of Food and Agriculture Migration, Agriculture and Rural Development.* Rome. Available from www.fao.org/state-of-food-agriculture/2018/en/.

——— (2019). *The State of Food and Nutrition in the World 2019.* Rome. Available from www.fao.org/state-of-food-security-nutrition.

Fujita, M. M., and J. F. Thisse (2002). Economics of agglomeration – cities, industrial location and regional growth. Cambridge.

Gobillon, L., H. Selod and Y. Zenou (2007). The mechanisms of spatial mismatch, *Urban Studies,* vol. 44, No. 12, pp. 2401-2427.

Gollin, D., R. Jedwab and D. Vollrath (2016). Urbanization with and without industrialization, *Journal of Economic Growth,* vol. 21, No. 2, pp. 35-70.

Gonsalves, G., and others (2015). Reducing Sexual Violence by Increasing the Supply of Toilets in Khayelitsha, South Africa: A Mathematical Model, *PLOS One* (29 April). Doi: 10.1371/journal.pone.0122244.

Grant, U. (2012). Urbanization and the employment opportunities of youth in developing countries. Background paper prepared for the Education for All Global Monitoring Report. Paris: UNESCO.

Harris, J., and M. Todaro (1970). Migration, Unemployment and Development: A Two-Sector Analysis, *The American Economic Review,* vol. 60, No., pp. 126-142.

Herman, M., and H. Khan (2008). Rapid urbanization, employment crisis and poverty in African LDCs: A new development strategy and aid policy. MPRA Paper No. 9499. Available from http://mpra.ub.uni-muenchen.de/9499/.

Hoffmann, E. M., and others (2019). Is the push-pull paradigm useful to explain rural-urban migration? A case study in Uttarakhand, India, *PLOS One*, vol. 14, No. 4.

Hommann, K., and S. V. Lall (2019). *Which Way to Livable and Productive Cities? A Road Map for Sub-Saharan Africa.* Washington, D.C.: World Bank. Available from: http://documents1.worldbank.org/curated/en/986321553833156431/pdf/Which-Way-to-Livable-and-Productive-Cities-A-Road-Map-for-Sub-Saharan-Africa.pdf.

Hoornweg, D., and others (2011). *Cities and Climate Change: Responding to an Urgent Agenda.* Washington, D.C.: The World Bank.

Huawei (2015). Global Connectivity Index 2015: Benchmarking Digital Economy Transformation. Available from www.huawei.com/minisite/gci/assets/files/gci_2015_whitepaper_en.pdf?v=20191217v2.

IHS Markit (2017). *The Urban Unconnected*. World Broadband Alliance.

Inter-American Development Bank (IADB) (2010). The Age of Productivity: Transforming Economies from the Bottom Up. Washington, D.C.

——— (2014). Rethinking Productive Development: Sound Policies and Institutions for Economic Transformation. Washington, D.C.

Intergovernmental Panel on Climate Change (IPCC) (2014). *The Synthesis Report (SYR) of the IPCC Fifth Assessment Report (AR5)*. Geneva. Available from https://www.ipcc.ch/report/ar5/syr/.

——— (2019). *IPCC Special Report on Climate Change and Land.* Summary for Policymakers. Geneva.

Internal Displacement Monitoring Centre (IDMC) (2014). *Global Estimates 2014: People displaced by disasters*. Geneva.

——— (2015). *Home sweet home: Housing practices and tools that support durable solutions for urban IDPs*. Geneva.

International Energy Agency (IEA) (2008). *World Energy Outlook 2009.* Paris.

——— (2019). *World Energy Outlook 2019.* Paris. Available from https://www.iea.org/reports/world-energy-outlook-2019.

International Labour Organization (ILO) (2018). *World Employment and Social Outlook 2018.* Geneva.

——— (2019). *World Employment and Social Outlook 2019.* Geneva.

——— (2020). *Global Employment Trends for Youth: Technology and the Future of Jobs.* Geneva. Available from www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_737648.pdf.

International Organization for Migration (IOM) (2015). *World Migration Report 2015: Migrants and Cities, New Partnerships to Manage Mobility.* Grand-Saconnex, Switzerland: IOM. Available from www.iom.int/world-migration-report-2015.

——— (2020). *World Migration Report 2020*. Grand-Saconnex, Switzerland: IOM. Available from https://publications.iom.int/books/world-migration-report-2020 .

Jones, D. W. (1989). Urbanization and Energy Use in Economic Development, *The Energy Journal,* vol. 10, pp. 29-44. Doi: 10.5547/ISSN0195-6574-EJ-Vol10-No4-3.

——— (1991). How urbanization affects energy use in developing countries, *Energy Policy,* vol. 19, No. 7, pp. 621-630.

——— (2004). Urbanization and energy. Encyclopedia of Energy (2004), pp. 329–335.

Kilroy, A. (2009). Intra-Urban Spatial Inequality: Cities as "Urban Regions". Available from https://www.researchgate.net/publication/279685754_Intra-Urban_Spatial_Inequality_Cities_as_Urban_Regions.

Kim, J. (2016). *Handbook on Urban Infrastructure Finance.* New Cities Foundation.

Kneeshaw, S., and J. Norman (2019). Gender Equal Cities. URBACT Knowledge Hub. Available from https://urbact.eu/sites/default/files/urbact-genderequalcities-edition-pages-web.pdf.

Kothari, M. (2007). Report of the Special Rapporteur on adequate housing as a component of the right to an adequate standard of living. A/HRC/4/18/Add.2. Geneva: United Nations. Available from https://digitallibrary.un.org/record/600545?ln=en.

Lewis, W. A. (1954). Economic development with unlimited supplies of labour, *The Manchester School*, vol. 22, No. 2, pp. 139-191.

Lin, J. Y. (2012). The Quest for Prosperity: How Developing Economies Can Take Off. Princeton, NJ: Princeton University Press.

Mabala, R. (2011). Youth and ''the hood'' – livelihoods and neighborhoods, *Environment and Urbanization,* vol. 23, pp. 157-181.

Madlener, R., and Y. Sunak (2011). Impacts of Urbanization on Urban Structures and Energy Demand: What Can We Learn for Urban Energy Planning and Urbanization Management? *Sustainable Cities and Society,* vol. 1, pp. 45-53.

MEASURE DHS. Demographic and Health Surveys. Various years. www. measuredhs.com/countries/start.cfm.

Moses, L.A.B., X. Guogping and L.C.L. John (2017). Causes and consequences of rural-urban migration: The case of Juba Metropolitan, Republic of South Sudan, *IOP Conference Series: Earth and Environmental Science*, vol. 81, No. 1, p. 012130. IOP Publishing.

New Urban Agenda (2016). Habitat III, National Reports. Available from http://habitat3.org/the-new-urban-agenda/preparatory-process/national-participation/.

Organisation for Economic Co-operation and Development (OECD) (2017). *Social Protection in East Africa: Harnessing the Future*. Paris. Doi: 10.1787/9789264274228-en.

——— (2018). The policy implications of digital innovation and megatrends in (smart) cities of the future: A project proposal. Paris.

——— (2019a). The circular economy in cities and regions. Paris.

——— (2019b). *Enhancing the Contribution of Digitalization to the Smart Cities of the Future*. Paris.

——— (2020). Environment at a Glance Indicators: Circular economy – waste and materials. Paris. Available from http://www.oecd.org/environment/environment-at-a-glance/Circular-economy-waste-and-materials-May-2020.pdf.

Organisation for Economic Co-operation and Development and others (2019). *International Migration and Displacement Trends and Policies Report to the G20.*

Organisation for Economic Co-operation and Development and Sahel and West Africa Club (2020). *Africa's Urbanisation Dynamics 2020: Africapolis, Mapping a New Urban Geography.* Paris.

Park, H. (2016). The Power of Cities. UNHCR Innovation Service. Available from https://www.unhcr.org/innovation/the-power-of-cities/.

Pfaltzgraff, L., and others (2013). Food waste biomass: A resource for high-value chemicals, *Green Chemistry,* vol. 15, pp. 307-314. Doi: 10.1039/C2GC36978H.

Pham, T., and others (2014). Food waste-to-energy conversion technologies: Current status and future directions, *Waste Management,* vol. 38. Doi: 10.1016/j.wasman.2014.12.004.

Poston, D., and L. Bouvier (2010). *Population and Society: An Introduction to Demography.* Cambridge, United Kingdom: Cambridge University Press.

Ravallion, M., S. Chen and P. Sangraula (2007). New Evidence on the Urbanization of Global Poverty. Policy Research Working Paper No. 4199. Washington, D.C.: The World Bank.

Revi, A., and others (2014). Urban areas. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability.* Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. C. B. Field and others, eds. Cambridge and New York: Cambridge University Press.

Rogers, A. (1982). Sources of Urban Population Growth and Urbanization, 1950-2000: A Demographic Accounting, *Economic Development and Cultural Change,* vol. 30, No. 3, pp. 483-506. Doi:10.1086/452573.

Rosenzweig, C., and others (2015). ARC3.2 Summary for City Leaders. Urban Climate Change Research Network. New York: Columbia University.

Saghir, J., and J. Santoro (2018). Urbanization in Sub-Saharan Africa: Meeting Challenges by Bridging Stakeholders. Washington, D.C.: Center for Strategic International Studies. Available from www.csis.org/analysis/urbanization-sub-saharan-africa.

Sassen, S., and others (2018). *Quito Papers and the New Urban Agenda.* Abingdon, Oxon: Routledge.

Saxenian, A. (1994). *Regional advantage: Culture and competition in Silicon Valley and Route 128.* Cambridge, MA: Harvard University Press.

Sears, A. (2018). The Future of AI: These Four Industries Will Change By 2030, *Bold Business* (30 November).

Sidhu, S. 2011. Biosolids: Human Health Impacts. Encyclopedia of Environmental Health.

Sims R., and others (2014). Transport. In *Climate Change 2014: Mitigation of Climate Change*. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. O. Edenhofer and others, eds. Cambridge and New York: Cambridge University Press.

Sironi, A., C. Bauloz and M. Emmanuel (2019). *International Migration Law: Glossary on Migration.* Geneva: IOM.

Smil, Vaclav (2019). *Growth: From Microorganisms to Megacities.* Cambridge, MA: The MIT Press.

Speak, S. (2019). The State of Homelessness in Developing Countries. Paper presented to the Expert Group Meeting on affordable housing and social protection systems for all to address homelessness. Nairobi: United Nations. Available from https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2019/05/SPEAK_Suzanne_Paper.pdf.

Spence, M., P. C. Annez and M. Buckley (2009). Urbanization and Growth: Commission on Growth and Development. Washington, D.C.: The World Bank.

Taylor, P. J. (2004). *World City Network.* London and New York: Routledge.

Tecuci, G. (2012). Artificial intelligence, *Wiley Interdisciplinary Reviews: Computational Statistics,* vol. 4, pp. 168-180.

Thebo, A. L., P. Drechsel and E. F Lambin (2015). Global assessment of urban and peri-urban agriculture: irrigated and rainfed croplands, *Environmental Research Letters,* vol. 9.

Turok, I. (2013). Resurgent African Cities? *Local Economy*, vol. 28, No. 2, pp. 139-141.

Turok, I., and G. McGranahan (2013). Urbanization and economic growth: The arguments and evidence for Africa and Asia, *Environment and Urbanization* vol. 25, No. 2, pp. 465-482. Doi: 10.1177/0956247813490908.

Twaweza (2010). It's our water too! Bringing greater equity in access to water in Kenya. Policy brief. Available from www.twaweza.org/go/it-s-our-water-too--bringing-greater-equity-in-access-to-water-in-kenya.

United Nations (2001). *The Component of Urban Growth in Developing Countries*. New York: Department of Economic and Social Affairs, Population Division.

——— (2008). Climate change and urbanization: effects and implications for urban governance. Discussion Paper prepared by David Satterthwaite. New York: United Nations.

——— (2010). World Urbanization Prospects: The 2009 Revision. Highlights. New York: Department of Economic and Social Affairs, Population Division.

——— (2014). *World Urbanization Prospects*. The 2014 Revision. New York: United Nations, Department of Economic and Social Affairs, Population Division.

——— (2015). *World Fertility Report 2015.* New York. Available from www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2020/Feb/un_2015_worldfertilityreport.pdf.

——— (2017a). *International Migration Report 2017.* Highlights. ST/ESA/SER.A/404. New York.

——— (2017b). *Principles and Recommendations for Population and Housing Censuses*. Revision 3, Statistical Papers (Ser. M). New York. Doi: doi.org/10.18356/bb3ea73e-en.

——— (2017c). *Trends in International Migrant Stock: The 2017 Revision.* New York. POP/DB/MIG/Stock/Rev.2017.

——— (2018a). World Cities in 2018 – Data Booklet. ST/ESA/SER.A/417. New York.

——— (2018b). *World Urbanization Prospects.* New York.

——— (2019). *World Urbanization Prospects: The 2018 Revision.* ST/ESA/SER.A/420. New York.

——— (2020). United Nations 2020. 14 Feb 2018. Indicator 11.1.1: Proportion of urban population living in slums, informal settlements or inadequate housing [Accessed 3Sep2020] https://unstats.un.org/sdgs/metadata/files/Metadata-11-01-01.pdf

United Nations Children's Fund (UNICEF) (2015). Early Childhood Development Programme. New York. Available from www.unicef.org/early-childhood-development.

United Nations Conference on Housing and Sustainable Urban Development (2017). Habitat III Policy Papers: Policy Paper 3 National Urban Policies. New York: United Nations. Available from http://habitat3.org/wp-content/uploads/Habitat%20III%20Policy%20Paper%203.pdf.

United Nations Conference on Trade and Development (UNCTAD) (2019). Global e-commerce sales surged to $29 trillion. Available from https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=2034.

United Nations Human Settlement Programme (UN-Habitat) (2013). *State of the World Cities Report 2012-2013.* Nairobi. Available from https://sustainabledevelopment.un.org/content/documents/745habitat.pdf.

——— (2015). *The Role of Cities in Productive Transformation.* Nairobi. Available from https://unhabitat.org/the-role-of-cities-in-productive-transformation.

——— (2016). *World Cities Report 2016: Urbanization and Development, Emerging Futures*. Nairobi. Available from https://unhabitat.org/world-cities-report.

——— (2017a). Economic Foundations for Sustainable Urbanization: A Study on Three-Pronged Approach. Nairobi. Available from http://bit.ly/390e30G.

——— (2017b). *The State of the World's Cities Report 2016/2017.* Nairobi.

——— (2020a). City-Wide Public Space Strategies: A Guidebook for City Leaders. Nairobi. Available from https://unhabitat.org/sites/default/files/2020/03/cwpss_guidebook_20200116.pdf.

——— (2020b). *Financing Sustainable Urbanization: Counting the Costs and Closing the Gap*. Nairobi.

UN-Water (2017). *The United Nations World Water Development Report 2017: Wastewater: The Untapped Resource.* Paris, UNESCO.

The World Bank (2008). *World Development Report 2008: Agriculture for Development.* Washington, D.C. Available from https://openknowledge.worldbank.org/handle/10986/5990.

The World Bank and International Monetary Fund (IMF) (2013). *Global Monitoring Report 2013: Rural-Urban Dynamics and the Millennium Development Goals*. Washington, D.C.

World Economic Forum (2018). White paper: Circular economy in cities evolving the model for a sustainable urban future. Geneva.

——— (2019). 10 cities are predicted to gain megacity status by 2030. Available from www.weforum.org/agenda/2019/02/10-cities-are-predicted-to-gain-megacity-status-by-2030/#:~:text=Delhi%20is%20due%20to%20overtake,joined%20by%20Hyderabad%20and%20Ahmedabad.

World Health Organization (2014). *Report on Violence and Health.* Geneva.

——— (2018). *WHO Global Status Report on Road Safety.* Geneva.

Xie, Yu, and Xiang Zhou (2014). Income Inequality in Today's China, *Proceedings of the National Academy of Sciences* vol. 111, No. 19, pp. 6928-6933.

Chapter 5

African Development Bank (AfDB) and others (2018). The Future of Work: Regional Perspectives. Doi: 10.18235/0001059.

Andrae, A. (2019). Comparison of Several Simplistic High-Level Approaches for Estimating the Global Energy and Electricity Use of ICT Networks and Data Centers. *International Journal of Green Technology,* vol. 5, pp. 50-63.

Austin, D., and M. K. Macauley (2001). *Cutting Through Environmental Issues: Technology as a double-edged sword.* Washington, D.C.: Brookings. Available from www.brookings.edu/articles/cutting-through-environmental-issues-technology-as-a-double-edged-sword/.

Brussevich, M., and others (2018). *Gender, technology, and the future of work*. Washington, D.C.: IMF.

Cette, G., L. Koehl and T. Philippon (2020). Labor share, *Economics Letters*, vol. 188, p. 108979.

Cheng, H.W.J., M. LaFleur and H. Rashid (2019). Data Economy: Radical Transformation or Dystopia?, *UNDESA Frontier Technologies Quarterly*. New York: United Nations.

Dengler, K., and B. Matthes (2016). Auswirkungen der Digitalisierung auf die Arbeitswelt: Substituierbarkeitspotenziale nach Geschlecht (The effects of digitalization on the world of work: substitution potential according to gender). Aktueller Bericht 24/2016. Nurnberg: Institut fuer Arbeitsmarkt und Berufsforschung. Available from http://doku. iab.de/aktuell/2016/aktueller_bericht_1624.pdf.

Efoui-Hess, M. (2019). Climate Crisis: The unsustainable use of online video – the practical case for digital sobriety. Paris: The Shift Project.

Falcão, T. (2018). New technologies and international tax cooperation. Background paper prepared for *World Economic and Social Survey 2018* (United Nations publication, Sales No. E.18.II.C.1).

Freeman, C., and C. Perez (1988). Structural Crises of Adjustment, Business Cycles and Investment Behaviour. In *Technical Change and Economic Theory*. G. Dosi and others, eds. Pisa, Italy: Sant'Anna School of Advanced Studies.

Goldfarb, A., and C. Tucker (2019). Digital Economics, *Journal of Economic Literature*, vol. 57, No. 1, pp. 3-43. Doi: 10.1257/jel.20171452.

Grant Thornton (2019). Proposed IRS Rules to Guide Cloud Transactions. Available from www.grantthornton.com/library/alerts/tax/2019/Flash/cloud-computing-rules-modernize-online-transactions.aspx.

Gutiérrez, G., and S. Piton (2019). Revisiting the global decline of the (non-housing) labor share. Unpublished paper. New York: New York University.

HEREmobility. Smart Traffic Systems 101: Components, Benefits, and the Big Data Connection. Available from https://mobility.here.com/learn/smart-transportation/smart-traffic-systems-101-components-benefits-and-big-data-connection.

International Energy Agency (IEA) (2019). World energy balances and statistics. Available from www.iea.org.

Kehrig, M., and N. Vincent (2018). *The micro-level anatomy of the labor share decline.* Cambridge, MA: National Bureau of Economic Research.

Kornfeld-Matte, R., and K. Hassine (2018). Two Revolutions: Digital and Demographic, *UN Chronicle*, vol. LV, Nos. 3 and 4 (December). https://unchronicle.un.org/article/two-revolutions-digital-and-demographic.

Murphy, N. (2019). Here's How Digitization Can Boost Recycling Rates. World Economic Forum. Available from www.weforum.org/agenda/2019/01/here-s-how-digitization-can-boost-recycling-rates/.

Oberhaus, D. (2019). A Solar 'Breakthrough' Won't Solve Cement's Carbon Problem. Wired.com (22 November). Available from www.wired.com/story/a-solar-breakthrough-wont-solve-cements-carbon-problem/.

Reiter, J. (2017). 4 Ways Governments Can Develop Digital Infrastructure. World Economic Forum (15 September). Available from www.weforum.org/agenda/2017/09/governments-develop-digital-infrastructure-vodafone/.

Roehrl, R. (2019). Exploring the impacts of ICT, new Internet applications and artificial intelligence on the global energy system. SLP/TFM research paper (December). Available from https://sustainabledevelopment.un.org/index.php?page=view&type=12&nr=3335.

Rognlie, M. (2015). Deciphering the fall and rise in the net capital share: accumulation or scarcity? *Brookings Papers on Economic Activity* (Spring), pp. 1-69.

Strubell, E., A. Ganesh and A. McCallum (2019). Energy and Policy Considerations for Deep Learning in NLP. Amherst, MA: University of Massachusetts Amherst. Available from https://arxiv.org/pdf/1906.02243.pdf.

United Nations. (2016a). *Global Sustainable Development Report 2016*. New York.

——— (2016b). Report of the Secretary-General on smart cities and infrastructure. 26 February. New York.

——— (2016c). *United Nations E-government Survey 2016: E-government in support of sustainable development.* New York.

——— (2017). The Impact of the Technological Revolution on Labour Markets and Income Distribution. Frontier Issues. New York.

——— (2018a). Unlocking the Potential of Knowledge and Technology for All. Frontier Issues. New York.

——— (2018b). *World Economic and Social Survey 2018: Frontier Technologies for Sustainable Development*. New York.

——— (2019a). *Sustainable Development Outlook 2019: Gathering Storms and Silver Linings*. New York.

——— (2019b). *World Population Prospects 2019: Highlights.* New York: United Nations. Available from https://population.un.org/wpp/Publications/Files/WPP2019_10KeyFindings.pdf.

——— (2020). Report of the Secretary-General on exploring space technologies for sustainable development and the benefits of international research collaboration in this context. 13 January. New York.

United Nations and Inter-agency Task Force (IATF) on Financing for Development (2019). *Financing for Sustainable Development Report 2019.* Available from https://developmentfinance.un.org/fsdr2019.

United Nations Conference on Trade and Development (UNCTAD) (2018). *Technology and Innovation Report 2018: Harnessing Frontier Technologies for Sustainable Development*. Geneva.

——— (2019a). Competition issues in the digital economy. TD/B/C.I/CLP/54, 1 May. Available at https://unctad.org/meetings/en/SessionalDocuments/ciclpd54_en.pdf.

——— (2019b). *Digital Economy Report 2019: Value Creation and Capture: Implications for Developing Countries*. Geneva.

——— (2019c). Report of the Intergovernmental Group of Experts on Competition Law and Policy on its eighteenth session. TD/B/C.I/CLP/55. Geneva. Available from https://unctad.org/meetings/en/SessionalDocuments/ciclpd55_en.pdf.

United Nations Environment Programme (UNEP) (2019). Time to Seize Opportunity, Tackle Challenge of E-waste. Press release, 24 January. Nairobi. Available from www.unenvironment.org/news-and-stories/press-release/un-report-time-seize-opportunity-tackle-challenge-e-waste.

United Nations Industrial Development Organization (UNIDO) (2020). *Industrial Development Report 2020: Industrializing in the Digital Age*. Vienna.

Chapter 6

Acemoğlu, D., and J. A. Robinson (2002). The political economy of the Kuznets curve, *Review of Development Economics,* vol. 6, No. 2, pp. 183-203.

——— (2012). *Why Nations Fail: The Origins of Power, Prosperity, and Poverty.* New York: Crown Business.

Alvaredo, F., and L. Gasparini (2015). Recent Trends in Inequality and Poverty in Developing Countries. In *Handbook of Income Distribution*, chapter 9, vol. 2A. A. Atkinson and F. Bourguignon, eds. Oxford, United Kingdom: North Holland Publications.

Atkinson, A. B. (2009). Factor shares: the principal problem of political economy? *Oxford Review of Economic Policy,* vol. 25, Issue 1 (spring), pp. 3-16. Doi: 10.1093/oxrep/grp007.

Atkinson, A. B., and A. Brandolini (2010). On Analyzing the World Distribution of Income, *The World Bank Economic Review,* vol. 24, Issue 1, pp. 1-37. Doi: 10.1093/wber/lhp020.

Atkinson, A. B., T. Piketty and E. Saez (2011). Top incomes in the long run of history, *Journal of Economic Literature*, vol. 45, No. 1, pp. 3-71.

Balestra, C., and R. Tonkin (2018). Inequalities in household wealth across OECD countries: Evidence from the OECD Wealth Distribution Database. OECD Statistics Working Papers, No. 2018/01. Paris: OECD Publishing. Doi: 10.1787/7e1bf673-en.

Banerjee, A., P. Niehaus and T. Suri (2019). Universal basic income in the developing world. NBER Working Paper No. 25598. Cambridge, MA: National Bureau of Economic Research.

Beaman, L, and others (2012). Female leadership raises aspirations and educational attainment for girls: a policy experiment in India, *Science*, vol. 335, pp. 582-586.

Black, R. E., and others (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries, *The Lancet*, vol. 382, No. 9890, pp. 427-451.

Bloom, N. (2017). Corporations in the age of inequality, *Harvard Business Review.* Available from https:// hbr.org/cover-story/2017/03/ corporations-in-theage-of-inequality.

Bourguignon, F. (2003). The growth elasticity of poverty reduction: explaining heterogeneity across countries and time periods. Working Paper No. 28104. Washington, D.C.: The World Bank.

——— (2015). *The Globalization of Inequality*. Princeton, NJ: Princeton University Press.

Brown, C., M. Ravallion and D. van de Walle (2017). Are poor individuals mainly found in poor households? Evidence using nutrition data for Africa. NBER Working Paper no. 24047. Cambridge, MA: National Bureau of Economic Research.

Brown A., M. Veronese Passarella and D. Spencer (2015). The nature and variegation of financialisation: A cross-country comparison. Working Paper Series No. 127. Financialisation, Economy, Society and Sustainable Development (FESSUD).

Canelas, C., and R. M. Gisselquist (2018). Human capital, labour market outcomes, and horizontal inequality in Guatemala, *Oxford Development Studies,* vol. 46, No. 3, pp. 378-397.

——— (2019). Horizontal inequality and data challenges, *Social Indicators Research,* vol. 145, No. 3, pp. 969-984.

Capaldo, J. (2015). The Trans-Atlantic Trade and Investment Partnership: European Disintegration, Unemployment and Instability, *Economia e Lavoro*.

Capaldo, J., and A. Izurieta (2018). Macroeconomic Effects of 21st Century Trade and Investment Agreements: The Case of the Trans-Pacific Partnership, *Development and Change*, vol. 49, No. 4, pp. 951-977.

Card, D., T. Lemieux and W. C. Riddell (2018). Unions and wage inequality: the roles of gender, skill and public sector employment. NBER Working Paper No. 25313. Cambridge, MA: National Bureau of Economic Research.

Carnoy, M. (2011). As higher education expands, is it contributing to greater inequality? *National Institute Economic Review*, vol. 215, pp. R34-R47.

Chattopadhyay, R., and E. Duflo (2004). Women as policy makers: Evidence from a randomized policy experiment in India, *Econometrica*, vol. 72, No. 5, pp. 1409-1443.

Cingano, F. (2014). Trends in Income Inequality and Its Impact on Economic Growth. OECD Social, Employment and Migration Working Papers, No. 163. Paris: OECD Publishing. Doi: 10.1787/5jxrjncwxv6j-en.

Coady, D., M. Grosh and J. Hoddinott (2004). *Targeting of Transfers in Developing Countries: Review of Lessons and Experience*. Washington, D.C.: The World Bank.

Committee on Economic, Social and Cultural Rights (2009). General Comment No. 20, para. 9. Economic and Social Council (E/C.12/GC/20 2).

Cramer, C. (2006). *Inflation, Inequality and Social Conflict*. Washington, D.C.: International Monetary Fund.

Dablas-Norris, E., and others (2015). *Causes and consequences of income inequality: A global perspective*. Washington, D.C.: IMF Strategic, Policy and Review Department.

Dang, H.-A. and P. Lanjouw (2015). Poverty dynamics in India between 2004 and 2012. Insights from longitudinal analysis using synthetic panel data. World Bank Policy Research Working Paper No. 7270. Washington, D.C.: The World Bank.

Daudey, E., and C. García-Peñalosa (2007). The personal and the factor distributions of income in a cross-section of countries, *The Journal of Development Studies*, vol. 43, No. 5.

de Onis, M., and F. Branca (2016). Childhood stunting: a global perspective, *Maternal and Child Nutrition*, vol. 12, Suppl. 1, pp. 12-26.

Diffenbaugh, N. S., and M. Burke (2019). Global warming has increased global economic inequality, *Proceedings of the National Academy of Sciences of the United States of America*, vol. 116, No. 20, pp. 9808-9813.

Dinkelman, T., and V. Ranchhod (2012). Evidence on the impact of minimum wage laws on an informal sector: Domestic workers in South Africa, *Journal of Development Economics*, vol. 99, Issue 1 (September), pp. 27-45.

Dodig, N., E. Hein and D. Detzer (2016). Financialisation and the Financial and Economic Crises: Theoretical Framework and Empirical Analysis for 15 Countries. In *Financialization and The Financial and Economic Crises: Country Studies*. N. Dodig, E. Hein and D. Detzer, eds. Cheltenham: Edward Elgar Publishing.

Duménil, G., and D. Lévy (2004). *Capital Resurgent: Roots of the Neoliberal Revolution*. Cambridge, MA: Harvard University Press.

Economic Commission for Latin America and the Caribbean (ECLAC) (2016a). *The social inequality matrix in Latin America*. Santiago: United Nations.

——— (2016b). *Social Panorama of Latin America 2016*. Santiago: United Nations.

——— (2018). *The inefficiency of inequality*. Santiago: United Nations.

——— (2019a). *Proposed Regional Agenda for Inclusive Social Development*. Third session of the Regional Conference on Social Development in Latin America and the Caribbean, XI Ministerial Forum for Development in Latin America and the Caribbean, Mexico City, 1-3 October.

——— (2019b). *Social Panorama of Latin America 2019*. Santiago: United Nations.

——— (2020). The social challenge in times of COVID-19. Special Report on COVID-19, No. 3 (May). United Nations.

Economic Policy Institute (EPI) (2018). State of Working America Data Library. Available from www.epi.org/data/. Accessed on 1 February 2019.

Economic and Social Commission for Asia and the Pacific (ESCAP) (2018a). *Inequality in Asia and the Pacific in the Era of the 2030 Agenda for Sustainable Development*. Bangkok: United Nations.

——— (2018b). *Inequality of Opportunity in Asia and the Pacific: Children's Nutrition*. Bangkok: United Nations.

——— (2019). *Closing the Gap: Empowerment and inclusion in Asia and the Pacific*. Bangkok: United Nations.

Economic and Social Commission for Western Asia (ESCWA) (2019). *Rethinking Inequality in Arab Countries*. Beirut: United Nations.

Elbers, C., and others (2005). Reinterpreting sub-group inequality decompositions. World Bank Policy Research Working Paper No. 3687. Washington, D.C.: The World Bank.

——— (2008). Reinterpreting between-group inequality, *Journal of Economic Inequality*, vol. 6, No. 3 (January), pp. 231-245.

Epstein, G. A. (2005). *Financialization and the World Economy*. Cheltenham: Edward Elgar Publishing.

Ferguson, James (2015). *Give a Man a Fish: Reflections on the New Politics of Distribution*. Durham, NC: Duke University Press.

Food and Agriculture Organization of the United Nations (FAO) (2017). *The State of Food and Agriculture in the World: Leveraging food systems for inclusive rural transformation*. Rome. Available from www.fao.org/3/ca6030en/ca6030en.pdf.

——— (2018a). *The future of food and agriculture – Alternative pathways to 2050*. Rome.

——— (2018b). *The State of Food and Agriculture in the World: Migration, agriculture, and rural development*. Rome. Available from www.fao.org/3/I9549EN/i9549en.pdf.

——— (2020). COVID-19 global economic recession: Avoiding hunger must be at the centre of the economic stimulus. Rome. Doi: 10.4060/ca8800en.

Food and Agriculture Organization of the United Nations (FAO) and others (2019), *The State of Food Security and Nutrition in the World 2019: Safeguarding against economic slowdowns and downturns*. Rome. Available from www.fao.org/3/ca5162en/ca5162en.pdf.

Freeman, R. B. (2009). Labour regulations, unions and social protection in developing countries: market distortions or efficient institutions? NBER Working Paper No. 14789. Cambridge, MA: National Bureau of Economic Research.

Galbraith, J. K. (2012). *Inequality and Instability. A Study of the World Economy Just Before the Great Crisis*. New York: Oxford University Press.

García-Peñalosa, C., and E. Orgiazzi (2013). Factor components of inequality: a cross-country study, *The Review of Income and Wealth*, vol. 59, No. 4.

Gelbach, J., and L. Pritchett (2002). Is more for the poor less for the poor? The politics of means-tested targeting, *The B.E. Journal of Economic Analysis & Policy*, vol. 2, No. 1.

Global Campaign for Education and Education International (2012). *Closing the Trained Teacher Gap*. Johannesburg: GCE.

Global Commission on Adaptation (2019). Adapt Now: A Global Call for Leadership on Climate Resilience. Available from https://cdn.gca.org/assets/2019-09/GlobalCommission_Report_FINAL.pdf.

Godoy, A., and M. Reich (2019). Minimum wage effects in low-wage areas. Institute for Research on Labour and Employment Working Paper No. 106-19 (July). Berkley, CA: IRLE.

Gollom, M. (2018). Ford Government ditched basic income pilot project before any data landed, researcher says. Canadian Broadcasting Corporation News Network, 3 August. Available from www.cbc.ca/news/canada/basic-income-pilot-project-ford-cancel-1.4771343.

Gornick, J., and M. Jäntti, eds. (2013). *Income Inequality: Economic Disparities and the Middle Class in Affluent Countries*. Palo Alto, CA: Stanford University Press.

Gradín, C. (2019). Occupational segregation by race in South Africa after apartheid, *Review of Development Economics*, vol. 23, No. 2, pp. 553-576.

Gradín, C. (2020). Changes in inequality within countries after 1990 using the WID. WIDER Working Paper 2020/116. Helsinki: UNU-WIDER. Doi: 10.35188/UNU-WIDER/2020/873-3.

Gradín, C., M. Leibbrandt and F. Tarp (2020). *Inequality in the Developing World*. Oxford, United Kingdom: Oxford University Press (forthcoming).

Gray, G. and E. Ortíz-Juarez (2020). Temporary basic income: protecting poor and vulnerable people in developing countries. New York: United Nations Development Programme.

Gruber, L., and S. Kosack (2014). The tertiary tilt: education and inequality in the developing world, *World Development*, No. 54. pp. 253-272.

Gutiérrez-Romero, R. and L. Méndez-Errico (2017). Does inequality foster or hinder the growth of entrepreneurship in the long-run?, *SSRN Electronic Journal*. Doi: 10.2139/ssrn.3054752.

Habermas, J. (1998). *The inclusion of the other: Studies in political theory*. Cambridge, MA: The MIT Press.

Hallegatte, S., and others (2016). Shock Waves: Managing the Impacts of Climate Change on Poverty. Climate Change and Development Series. Washington, D.C.: World Bank Group.

Hein, E. (2012). *The Macroeconomics of Finance-Dominated Capitalism – And its Crises*. Cheltenham: Edward Elgar Publishing.

Henley, J. (2018). Finland to end basic income trial after two years, *The Guardian*, 23 April. Available from www.theguardian.com/world/2018/apr/23/finland-to-end-basic-income-trial-after-two-years.

Herzer, D. (2016). Unions and income inequality: a heterogenous panel co-integration and causality analysis, *Labour*, vol. 30, Issue 3, pp. 318-346.

International Federation of Accountants (IFA) and Association of Chartered Certified Accountants (ACCA) (2019). G20 Public Trust in Tax. Surveying Public Trust in G20 Tax Systems.

International Labour Organization (2011). Determinants of global imbalances: Economic, institutional and social factors that shape the global economy. EC-IILS Joint Discussion Paper Series, No. 4. Geneva.

——— (2015). *Labour Markets, Institutions and Inequality: Building just societies in the 21st century*. J. Berg, ed. Cheltenham, United Kingdom and Geneva: Edward Elgar and the International Labour Office.

——— (2016). *Global Wage Report 2016/17: Wage Inequality in the Workplace.* Geneva.

——— (2017). *Europe's disappearing middle class? Evidence from the world of work*. D. Vaughan-Whitehead, ed. Cheltenham, United Kingdom and Geneva: Edward Elgar and the International Labour Office.

——— (2018a). *Global Wage Report 2018/19: What lies behind the gender pay gap*. Geneva.

——— (2018b). *Reducing inequalities in Europe: How industrial and labour policies can close the gap*. D. Vaughan-Whitehead, ed. Cheltenham, United Kingdom and Geneva: Edward Elgar and the International Labour Office.

——— (2018c). *Women and men in the informal economy: A statistical picture*. Geneva.

——— (2018d). *World Employment and Social Outlook 2018: Greening with Jobs*. Geneva.

——— (2019a). *Convergence in the EU: What role for industrial relations?* D. Vaughan-Whitehead, ed. Cheltenham, United Kingdom and Geneva: Edward Elgar and the International Labour Office.

——— (2019b). *Work for a Brighter Future – Global Commission on the Future of Work*. Geneva.

——— (2020a). Covid-19 and the world of work, third edition. Updated estimates and analysis (29 April). Available from www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/documents/briefingnote/wcms_743146.pdf.

——— (2020b). Gender equality in the workplace remains elusive. ILOSTAT blog. Available from https://ilostat.ilo.org/2020/01/10/gender-equality-in-the-workplace-remains-elusive/.

——— (2020c). ILO Monitor: COVID-19 and the world of work, fifth edition. Updated estimates and analysis (30 June).

——— (2020d). *World Employment and Social Outlook – Trends 2020.* Geneva.

Izurieta, A., P. Kohler and J. Pizarro (2018). Financialization, Trade, and Investment Agreements: Through the Looking Glass or Through the Realities of Income Distribution and Government Policy? GDAE-UNCTAD Working Paper Series No. 03-18 (June).

Jain-Chandra, S., and others (2018) Inequality in China – Trends, Drivers and Policy Remedies. IMF Working Paper WP/18/127. Washington, D.C.: IMF.

Jenkins, S. P., and others (2013). *The Great Recession and the distribution of household income*. Oxford, United Kingdom: Oxford University Press.

Keeley, B. (2015). How does income inequality affect our lives?, In *Income Inequality: The Gap between the rich and the poor*. Paris: OECD. Doi: 10.1787/9789264246010-6-en.

Khamis, M. (2008). Does the minimum wage have a higher impact on the informal than on the formal labour market? Evidence from quasi-experiments. IZA Discussion Paper No. 3911. Bonn: IZA.

Kohler, P. and S. Storm (2016), CETA without Blinders: How Cutting "Trade Costs and More" Will Cause Unemployment, Inequality, and Welfare Losses, *International Journal of Political Economy*, vol. 45, No. 4.

Korpi, W., and J. Palme (1998). The paradox of redistribution and strategies for equality: welfare state institutions, inequality and poverty in Western countries, *American Sociological Review*, vol. 63, No. 5 (October), pp. 661-687.

Kozul-Wright, R., and K. Gallagher (2019). *A New Multilateralism for Shared Prosperity: Geneva Principles for a Global Green New Deal*. Boston and Geneva: Global Development Policy Center and UNCTAD.

Lakner, C., and B. Milanovic (2016). Global Income Distribution: From the Fall of the Berlin Wall to the Great Recession, *World Bank Economic Review*, vol. 30, No. 2, pp. 203-232. Doi: 10.1093/wber/lhv039.

Leibbrandt, M., A. Finn and I. Woolard (2012). Describing and decomposing post-apartheid income inequality in South Africa, *Development Southern Africa*, vol. 29, No. 1, pp. 19-34.

Lindert, P. (2004). *Growing Public: Social Spending and Economic Growth since the Eighteenth Century*. New York: Cambridge University Press.

Malapit, H., and A. Quisumbing (2016). Gendered pathways to better nutrition, *Rural,* vol. 21, 15-17. Available from www.rural21.com/uploads/media/rural2016_01-S15-17.pdf.

Marcus, R., A. Mdee and E. Page (2016). *Anti-discrimination policies and programmes in low- and middle-income countries: experiences in political participation, education and labour markets*. London: Chronic Poverty Advisory Network, Overseas Development Institute.

Michell, J., and J.Toporowski (2013). Critical Observations on Financialization and the Financial Process, *International Journal of Political Economy*, vol, 42, No. 4, 67-82.

Milanovic, B. (2010). *The Haves and the Have-Nots: A Brief and Idiosyncratic History of Global Inequality*. Philadephia, PA: Basic Books.

——— (2016). *Global Inequality. A New Approach for the Age of Globalization*. Cambridge, MA: Harvard University Press.

Mokleiv Nygard, H. (2018). Inequality and conflict – some good news. Development for Peace (DEV4PEACE). Washington, D.C.: The World Bank.

Murgai, R., and M. Ravallion (2005). Is a guaranteed living wage a good antipoverty policy? World Bank Policy Research Working Paper No. 3640. Washington, D.C.: The World Bank.

Nolan, B., ed. (2018). *Inequality and Inclusive Growth in Rich Countries: Shared Challenges and Contrasting Fortunes*. Oxford, United Kingdom: Oxford University Press.

Odusola, A., and others, eds. (2017). *Income Inequality Trends in sub-Saharan Africa: Divergence, Determinants and Consequences*. New York: UNDP.

Organisation for Economic Co-operation and Development (OECD) (2014). Focus on Inequality and Growth (December). Paris. Available from www.oecd.org/els/soc/Focus-Inequality-and-Growth-2014.pdf.

——— (2015). *In It Together: Why Less Inequality Benefits All*. Paris.

——— (2017). *OECD Employment Outlook 2017*. Paris.

——— (2018). *A broken social elevator? How to Promote Social Mobility*. Paris.

——— (2019a). *Under pressure: the squeezed middle class*. Paris.

——— (2019b). LFS – Decile ratios of gross earnings. Available from https://stats.oecd.org/Index.aspx?DatasetCode=DEC_I. Accessed on 4 December 2019.

Oxfam (2016). Extreme carbon inequality: Why Paris climate deal must put the poorest, lowest emitting and most vulnerable people first. Available from www-cdn.oxfam.org/s3fs-public/file_attachments/mb-extreme-carbon-inequality-021215-en.pdf.

Patnaik, P. (2010). The diffusion of activities, *Economic and Political Weekly*, vol. 45, No. 10, pp. 40-45.

Pew Research Center (2014). Emerging and developing economies much more optimistic than rich countries about the future (October).

Phillipon, T., and A. Resheff (2009). Wages and human capital in the U.S. financial industry: 1909-2006. Working Paper No. 14644. Cambridge, MA: National Bureau of Economic Research.

Picketty, T. (2014). *Capital in the Twenty-First Century*. Cambridge, MA: The Belknap Press of Harvard University Press.

——— (2018). Brahmin left vs. merchant right: rising inequality and the changing structure of political conflict. WID.world Working Paper Series No. 2018/7. World Inequality Lab. Paris: Paris School of Economics.

——— (2020). *Capital and Ideology*. Cambridge, MA and London: The Belkmap Press of Harvard University Press.

Power, D., G. Epstein and M. Abrena (2003). Trends in the rentier income share in OECD countries, 1960–2000. Working Papers No. 58a, Political Economy Research Institute. Amherst, MA: University of Massachusetts.

Protzer, E. (2019). Social Mobility Explains Populism, Not Inequality or Culture. CID Research Fellow & Graduate Student Working Paper No. 118.

Rajan, R. (2010). *Fault Lines: How Hidden Fractures Still Threaten the World Economy*. Princeton, NJ: Economics Books, Princeton University Press.

Rani, U. (2017). Minimum wage policies and their effect in developing countries: a comparative perspective. *The Indian Journal of Labour Economics*, vol. 60, Issue 1 (March), pp. 33-55.

Ravallion, M. (2007). How relevant is targeting to the success of an antipoverty program? World Bank Policy Research Working Paper No. 4620. Washington D.C.: World Bank.

——— (2018). Inequality and Globalization: A Review Essay, *Journal of Economic Literature*, vol. 56, No. 2, pp. 620-642. Doi: 10.1257/jel.20171419.

Reddy, A. B. (2015). Changes in intergenerational occupational mobility in India: evidence from national sample surveys 1983-2012, *World Development*, vol. 76 (December), pp. 329-343.

Sassen, S. (1991). *The Global City: New York, London and Toyko.* Princeton, NJ: Princeton University Press.

Seccareccia, M., and M. Lavoie (2016). Income distribution, rentiers, and their role in a capitalist economy: A Keynes–Pasinetti perspective, *International Journal of Political Economy*, vol. 45, No. 3, pp. 200-223.

Sennett, R., R. Burdett and S. Sassen (2018). *The Quito Papers.* New York: Routledge Press.

Servan-Mori, E., and others (2014). An explanatory analysis of economic and health inequality changes among Mexican indigenous people, 2000-2010, *International Journal for Equity in Health*, vol. 13, No. 21.

Stiglitz, J. (2012). *The Price of Inequality: How Today's Divided Society Endangers Our Future*. New York: W. W. Norton & Company.

——— (2015). Inequality and economic growth, *Political Quarterly*, vol. 86, No. S1, pp. 134-155.

Stockhammer, E. (2004). Financialisation and the slowdown of accumulation, *Cambridge Journal of Economics*, vol. 28, No. 5, pp. 719-741.

——— (2013). Financialization and the World Economy. In *The Handbook of the Political Economy of Financial Crises*. G. Epstein and M. Wolfson, eds. New York: Oxford University Press.

Storm, S. (2018). Financialization and Economic Development: A Debate on the Social Efficiency of Modern Finance, *Development and Change,* vol. 49, No. 2, pp. 302-329. Doi: 10.1111/dech.12385.

Sumner, A. (2013). Who are the poor? New regional estimates of the composition of education and wealth "poverty" by spatial and social inequalities. ODI Working Paper no. 378 (April). Overseas Development Institute.

Sumner, A., E. Ortiz-Juarez and C. Hoy (2020). Estimates of The Impact of Covid-19 on Global Poverty. WIDER Working Paper 2020/43. Helsinki: UNU-WIDER.

Torpey-Saboe, N. (2018). *Measuring Education Inequality in Developing Countries*. New York: Springer.

United Nations (2015). *The World's Women 2015: Trends and Statistics*. New York.

——— (2016). *Report on the World Social Situation 2016: Leaving no one behind – the imperative of inclusive development*. New York. Sales No. E.16.IV.1.

——— (2018a), *Promoting Inclusion through Social Protection. Report on the World Social Situation 2018*. New York. Sales No. E.17.IV.2.

——— (2018b). *World Urbanization Prospects: The 2018 Revision*. New York. Available from https://population.un.org/wup/. Accessed on 13 June 2019.

——— (2019). *Special edition: progress towards the Sustainable Development Goals. Report of the Secretary-General.* New York.

——— (2020a). *The Sustainable Development Goals Report 2020.* New York.

——— (2020b). *World Social Report 2020. Inequality in a Rapidly Changing World*. New York. Sales No. E.20.IV.1.

United Nations Conference on Trade and Development (UNCTAD) (2017). *Trade and Development Report 2017: Beyond Austerity Towards a Global New Deal*. New York, Geneva: UNCTAD.

——— (2018). *Trade and Development Report 2018: Power, Platforms and the Free Trade Delusion*. New York and Geneva: UNCTAD.

——— (2019). *Trade and Development Report 2019: Financing a Global Green New Deal*. New York and Geneva: UNCTAD.

United Nations Development Programme (UNDP) (2019). *Human Development Report 2019. Beyond income, beyond averages, beyond today: Inequalities in human development in the 21st century*. New York.

——— (2020). COVID-19 and Human Development: Assessing the Crisis, Envisioning the Recovery. Human Development Perspectives. New York.

United Nations Educational, Scientific and Cultural Organization (UNESCO) (2019). *Global Educational Monitoring Report 2019*. Paris.

University of Maryland (2015). *The Minorities at Risk Project*. College Park, Maryland: University of Maryland, Center for International Development and Conflict.

Vasudevan, R. (2016). Financialization, Distribution and Accumulation: A Circuit of Capital Model with a Managerial Class, *Metroeconomica, Special Issue on Inequality: Causes, Consequences and Policy Responses*, vol. 67, No. 2 (May), pp. 397-428.

Wei, R. C., A. Andree and L. Darling-Hammond (2009). How nations invest in teachers: high-achieving nations treat their teachers as professionals, *Educational Leadership*, vol. 66, No. 5, pp. 28-33.

The World Bank (2016). *Poverty and Shared Prosperity 2016: Taking on Inequality*. Washington, D.C.

——— (2018). *Poverty and Shared Prosperity 2018: Piecing together the poverty puzzle*. Washington, D.C.

——— (2020). *Global Economic Prospects, June 2020.* Washington, D.C.

World Inequality Lab (2018). *World Inequality Report*. Paris.

Young, A. (2013). Inequality, the urban-rural gap and migration, *The Quarterly Journal of Economics*, vol. 128, No. 4, pp. 1727-1785.

Report of the UN Economist Network for the UN 75th Anniversary

Shaping the Trends of Our Time

The report examines five megatrends – climate change and natural capital; demographic shifts, particularly population ageing; urbanization; the emergence of digital technologies; and inequalities – that are affecting economic, social and environmental outcomes. Efforts to reverse or redirect these trends must be reinforced to ensure that we achieve the full measure of the 2030 Agenda, and set the stage for an inclusive, sustainable and equitable future during the next 75 years.

All are the result of human activity, and as such, they can be shaped by human decisions and policy choices. By making the right choices today, without further delay, it is not too late to shape the major trends of our time in a direction that is sustainable and delivers benefits to all. Policies can influence a single megatrend as well as other megatrends that interact with it. This creates the potential for co-benefits, where a positive result is achieved in one area through an intervention designed to generate change in another. Such policy interventions can propel more effective, mutually reinforcing changes, and significantly greater impacts.

The United Nations can help to frame responses to the megatrends in terms that encourage domestic political consensus to form behind taking sustained action. In doing so, the United Nations can assist in mobilizing needed global support for individual countries, particularly those with fewer resources.

United Nations

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