Policy Brief

# The Megacity Resilience Framework

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# overview

Since 2008, for the first time in human history, more than half of the global population lives in cities. Urbanisation is currently one of the most powerful transformation processes on our planet. Megacities are an extreme product of this development posing new challenges to and opening unique opportunities for mankind. After providing a brief overview on the global urbanisation process, the policy brief introduces vulnerability and resilience as concepts that allow for new perspectives on megacities. These perspectives are "the global and the local", "the formal and the informal" and "the social and the ecological". The Megacity Resilience Framework that is introduced captures these perspectives and highlights further research desiderata. The paper concludes with policy recommendations to increase resilience and sustainability of megacities.

## THE URBAN TURN

Currently, our global society is witnessing a transformation of historic dimensions. The process of urbanisation is transforming societies and physical landscapes worldwide. Urbanisation is one of the most powerful forces that humankind is presently imposing on our planet.

Globally, the share of population living in cities has risen significantly over the past six decades. In 1950, roughly 38% of the world´s population lived in cities. Today - for the first time in human history - every second citizen lives in an urban settlement. The actual urban population has more than tripled, from 960 million in 1950 to 3.3 billion in 2008. Researchers therefore labelled the crossing of the 50% threshold in 2008 the "urban turn". The current growth of the urban population is mainly taking place in the South. The industrialised countries experienced the most excessive growth of urban settlements throughout the 20th century. In these parts of the world, three quarters of the population already lived in cities by 1990. At the same time, the corresponding figure was only 37% for the developing world. While the pace of urbanisation has slowed down severely in the industrialised countries, it has paced up drastically in Asia and Africa. In fact, the whole population growth in the developing world is currently taking place in cities. The urban turn can therefore be regarded as one of the biggest challenges for the societies in low- and middle-income countries. One phenomenon of this urban turn is the development of a new category of human settlements – the megacities.

## MEGACITIES – A NEW CATEGORY OF HUMAN SETTLEMENTS

Researchers created the term "megacity" to address cities which exceed other cities or urban agglomerations in terms of size, speed of growth, and complexity. So far there is no consensus on when a city can be labelled a "megacity." While some already include cities at a size of five million inhabitants in this category, others set a minimum threshold of eight or ten million. However they may be defined, these new types of settlements have some qualitative characteristics that make them unique. Among them are: their complexity, their dynamics, their attractiveness for migrants, their connectedness to global processes and their influence on at least a regional scale.

The rise in the number of megacities, which are the most excessive products of the current global urbanisation, is strongly linked to the urban turn. Just like the current urbanisation process, which has its hotspots in the global South, the world's megacities are concentrated in the low- and middle-income countries (see Fig. 1). The majority of the megacities in Asia, Africa and South America still show very high growth rates. This development bears significant environmental, societal and economic risks, but also offers unique opportunities for sustainable development.

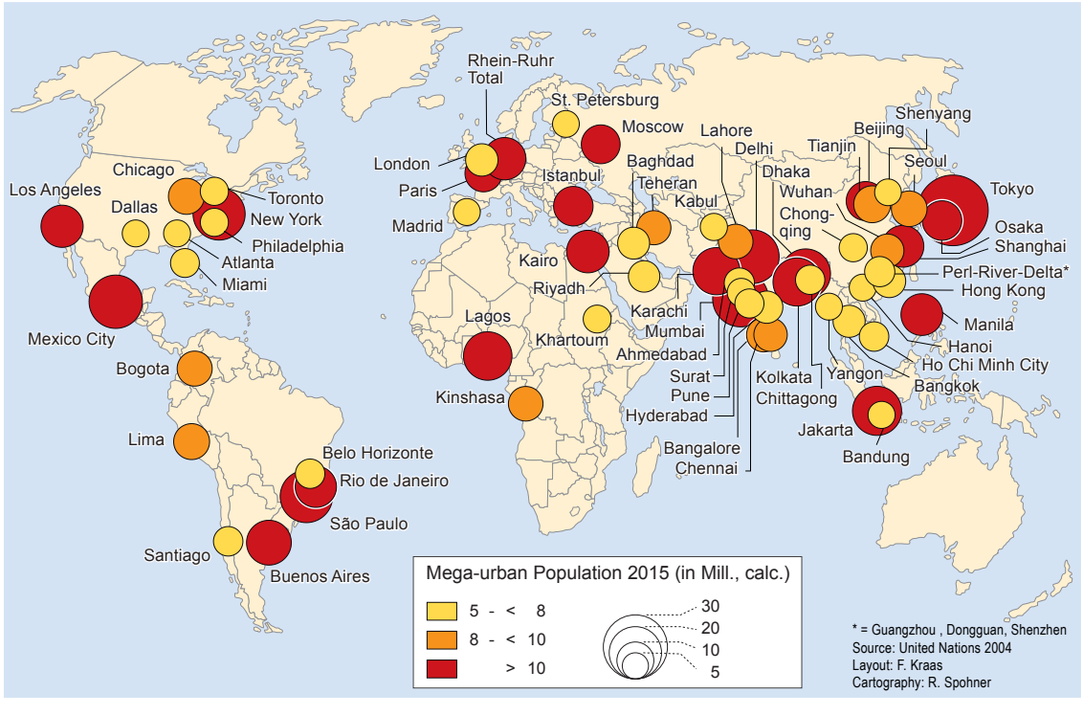
## VULNERABILITY AND RESILIENCE IN MEGACITIES

Vulnerability and resilience are closely related concepts. Vulnerability refers, on the one hand, to the exposure of people or even whole systems, like a city, to disturbances, such as a natural hazard, an economic crisis or political upheaval. On the other hand, vulnerability refers to the (in-) capability of individuals, groups or institutions to anticipate, cope with and adapt to these risks. Thereby they can prevent or recover from harm. In contrast, resilience refers to robustness, persistence and sustainability. Resilience can be understood as the ability of a system to absorb shocks and stresses without collapsing. Self-organization, high flexibility, diversity and large capacities for adaptation, recovery and learning are central aspects of resilience.

A (mega-) city can be regarded resilient if its inhabitants and institutions function effectively. That means that they are able to deal with unexpected disturbances and adapt to change. Furthermore, ecosystem services and their social and economic use by humans must be balanced. In this sense, the resilience of such a socio-ecological system is closely related to the concept of sustainability (economic, social and ecological). When conditions of vulnerability are addressed, the aim is to assess and increase peoples' adaptive capacities, reduce their exposure to risks, strengthen their persistence and promote their human security.

Life in megacities offers various advantages for the inhabitants: they enjoy improved economic opportunities, they have easier access to basic services, such as electricity, water and sanitation systems, and can participate in a comparatively rich cultural life. However, with increasing social polarisation, segmentation and fragmentation, the number of people that are excluded from these benefits is growing. Within megacities, these vulnerable populations are concentrated, for instance, in slums. They are vulnerable to the effects of economic, social and political insecurity, economic exploitation, environmental pollution, natural disasters, health crises, and food insecurity. Their livelihoods are at risk due to their informal status impeding their labour, tenure and political rights. Other risks stem from their poor living environment which is particularly affecting their health, and their dependence on the cash economy, making them extremely susceptible to price hikes and financial crises.

Fig. 1



In contrast to the unjustifiable conditions of the urban poor, megacities also offer unique opportunities for increasing human security and a new quality of social resilience. This is a new and increasingly accepted perspective on megacities. While some address megacities only as "mega-problem-cities", others describe them as `laboratories´ of global change, in general, and of the global urbanisation process, in particular. People are densely concentrated in these large urban agglomerations. Thereby, the flows of goods, money, knowledge and information are not only quicker, but could be potentially more efficient than in smaller cities or rural areas. For instance, economic processes could be optimised and become more flexible, the use of resources could be channelled more effectively and decisions could be made faster. This could result in greater adaptive capacities in the light of risks and disturbances.

In this sense, analysing the inherent dynamics of megacities not only exposes the challenges of the new urban millennium, but can also provide solutions for a sustainable urban future. Such an analysis will have to include strategies to reduce vulnerabilities and to increase the resilience of the megacity. Then, the perception of megacities could shift from "global risk areas" towards "engines of global change" and towards "resilient socio-ecological systems" with a sustainable future.

## THREE PERSPECTIVES ON MEGACITIES

In order to capture people's vulnerabilities to disasters, disruptions and stresses, as well as their capacities to be resilient because of and in spite of the complexity of megacities, a comprehensive analytical framework – the Megacity Resilience Framework – has been developed. It dissects the vulnerability/resilience nexus of a megacity from three perspectives:

### 1 The Global and the Local – Inseperable Linkages on the Spatial Scale

- Globalisation has led to a "space-time compression of the world". Local-global networks of interaction have, thereby, intensified greatly. Global processes have ramifications on the local level. Likewise, incidences on the local level of a megacity can have global impacts. In this regard, megacities are shaped by and are shaping globalisation.

- Global flows and global networks that are the result of globalisation are nevertheless localised and concentrated in space and time. Global cities, most often megacities, are localised hubs and nodal points that are crucial for the functioning of the global economy.

- These described processes are shaping the everyday life of people living in megacities. Due to the embeddedness and connectivity of megacities, these people are more intensively exposed to various "glocal" processes.

**Example**: The dream of millions of US citizens of owning a home with the help of sub-prime credits ended for the time being with the collapse and the takeovers by national governments of major banks with headquarters in global cities such as New York or London. The global meltdown induced by this (national) crisis will lead to job losses afar in export-dependent economies, such as China. Labourers in megacities like Guangzhou, the "factory of the world", which are deeply embedded in the global trade network, will be affected rapidly and intensively by this global crisis. This has been addressed by several authors in a concept called "glocalization", which points to the inseparable linkages between the global and the local.

Mega-urban resilience can be improved by valuing diversity, by empowerment of excluded groups and knowledge-sharing.

### 2 The Formal and the Informal – Intertwined and Often Indistinguishable

- In all megacities in developing countries, administration and formal markets cannot effectively organize urban life, nor can they adequately respond to rapid urban growth. As a consequence, informality becomes the dominant organizing logic of economies. It provides livelihoods for millions of people.

- Due to informality, the urban poor are highly vulnerable to exploitation, state arbitrariness, and to environmental hazards. Their informal networks, however, have become important resources as formal economies and governance systems are functioning insufficiently. The poor apply flexible informal strategies and are, thereby, able to cope with unexpected disturbances. Thus, these networks contribute to an increase of mega-urban resilience.

- Acting informally is not only a characteristic of low-income groups. Transnational corporations, for example, increase the flexibility of labour

contracts in order to improve their agility and performance. Thereby, they are able to compete on global markets and react swiftly to sudden disturbances.

**Example**: Close interactions between formal and informal activities exist in the organisation of the food supply to the megacity Dhaka, the capital of Bangladesh. There, the procurement for tender, import and storage of rice, the major food staple, are largely controlled by government agencies. These formal activities co-exist and overlap with the informal business strategies that are pursued by traders. Merchants in officially registered enterprises, as well as unregistered vendors on the streets, often circumvent official regulation. In that way, they ensure the provision of food for the entire megacity. Informal activities are thus not marginal or inefficient, but rather significant contributions to the functionality and efficiency of a megacity.

## 3 The Social and the Ecological— Coupled and Interdependent

- Urbanisation means that humans create a new, artificial environment fit to their needs. But societal relations also change with the transformation of a rural society into an urban one and keep on changing within urban societies. Social and ecological transformations do not only take place simultaneously, but are coupled processes that strongly influence each other.

- The socio-ecological perspective attempts to overcome the dualistic view on nature and society as separated entities. Although appearing as merely artificial in the first place, mega-urban settlements are living environments for millions of people who make use of multiple ecosystem services. In practice, it is almost impossible to differentiate between "the man-made" and "the natural" spheres of the megacity.

- As a co-produced urban environment, megacities offer both chances and risks, providing and limiting livelihood options for their inhabitants.

**Example**: One of the strongest indicators for the socio-ecological condition of a mega-urban society is human health. The incidents occurring in Jakarta, the capital of Indonesia, in 1998, are an illustrative example for socio-ecological changes and their effects on health. In that year, two different events on the global level – El Niño, as a climatic disturbance, and the Asian financial crisis – took concretion in Jakarta at the same time. High

The slum Karail opposite the rich business quarter Gulshan in Dhaka.
Picture: Benjamin Etzold, February 2007

In the megacity Dhaka (Bangladesh) the largest squatter settlement Karail (left) is situated next to Gulshan (right), a quarter of diplomats, banks and international development agencies, only separated by the Banani Lake. The three fields of tension become visible in the picture:

1) Local-global: Urban poverty is localised in Karail, while the affluence of Gulshan mainly stems from globalization processes.

2) Formal-informal: Formal economic processes dominate Gulshan. However, this also creates opportunities for informal employment. The small boats, which carry Karail's people over the lake to their workplace, are a symbol of multiple formal-informal linkages in Dhaka.

3) Social-ecological: A constant threat to the inhabitants of Karail is flooding in the monsoon season, while Gulshan is not affected to the same extent. However, both areas suffer from, but also contribute to, air, water and noise pollution.

rainfalls led to extensive water logging, particularly in unfinished concrete buildings that were the most obvious remains of the financial crisis. These new ecological niches offered excellent breading conditions for mosquitoes as vectors for malaria and dengue fever. The rapid changes in socio-ecological conditions in Jakarta resulted in epidemics that depleted the health status of an already distressed society.

## THE MEGACITY RESILIENCE FRAMEWORK

Megacity resilience is defined for this framework as the combined resiliencies of all systemic components of a megacity. The analytical approach is based on the following assumptions:

- Megacities are influenced by complex interwoven processes (economical, political, ecological, social etc.) on different scales (from the local to the global).
- Megacity governance depends on the interplay between formal and informal institutions.
- Megacities must be conceived as coupled socio-ecological systems.
- Megacities are spaces of opportunities and risks. Different groups of urban citizens, due to their differing capabilities, networks and linkages have specific risk and vulnerability profiles.
- The resilience of megacities is among the most prominent features of sustainable urban development. Enhancing resilience at all steps of the urbanisation process is one of the greatest challenges in this respect.

## DESCRIPTION OF THE FRAMEWORK

The central message of the Megacity Resilience Framework (Fig. 2) is that the interaction of people and institutions takes place at the intersection between purely formal and informal spheres. These are, in turn, embedded in the coupled socio-ecological system of the megacity and influenced by processes from the global to the local level. In the framework, the abstract entity, megacity resilience, is illustrated by using the metaphor of a sphere. This sphere is either expanding (increasing resilience) or contracting (reducing resilience) in time. The framework thereby emphasizes the dynamic notion of resilience and vulnerability.

The interaction between people and institutions determines the regulation of a megacity and its resilience. People are, in this context, understood as acting individuals with a specific endowment of resources and capabilities. Institutions, on the other hand, are defined in their broadest sense including the common notion of constituencies, codified laws and rules, as well as social norms, habitualised behaviour and taboos. Both people and institutions can withstand unexpected disturbances. However, the extent to which challenges can be overcome – and thus their specific vulnerabilities and resiliencies – differ significantly. Such a critical threshold will be reached if people or institutions are threatened in their existence.

> Megacities are shaped by and are shaping globalisation.

But it is the nature of the relation between people and institutions, and in particular the interplay between formal and informal institutions, that leads to either an increase of vulnerability (red arrow = contraction of the sphere, see Fig. 2) or an increase of resilience (green arrow = expansion, see Fig. 2). Can people rely on functioning formal institutions in case of disturbances, for instance on disaster management, relief and recovery implemented by state or city authorities in case of a natural disaster? Or do they mainly have to organize help themselves and trust in their membership in social networks to reduce their losses in such an event and secure their livelihoods thereafter?

There are some key processes that increase the vulnerability of a megacity. Among these are social exclusion (e.g. from decision making), exploitation (e.g. of workforce), ignorance (e.g. unsustainable processes), fragmentation (esp. social segregation processes), hubris (e.g. faith in technical solutions) and rejection of variety (e.g. in a planned artificial environment). In contrast, mega-urban resilience can be fostered by following ethical principals (e.g. good governance), by valuing diversity (e.g. cultural, bio-diversity, etc.), by empowerment of excluded groups (e.g. inclusion in decision making), by improving the access to basic services (e.g. health and education services), by knowledge-sharing, by learning from crises in the past, and by facilitating the cooperation of decisive actors (e.g. public-private partnerships).

## RESEARCH AGENDA

The Megacity Resilience Framework, on the one hand, opens up a new research agenda, and, on the other hand, shows starting points for policy intervention. Research questions arising from the

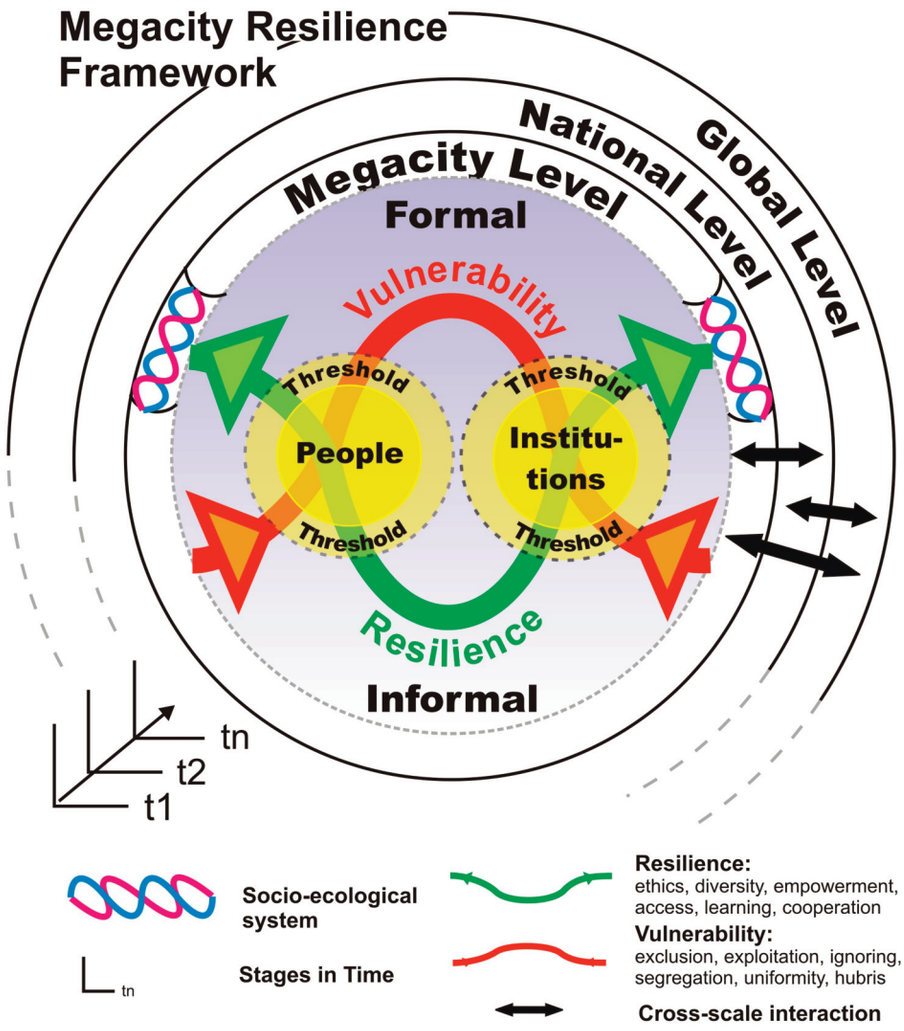



Fig. 2

framework can be summarised under three labels: conceptual, integrative, and internal.

a) One policy-relevant conceptual research question is how vulnerability and resilience can be measured. One of the main desiderata that emerge from the Megacity Resilience Framework is that scientists will have to develop indicators that allow decisionmakers to take concrete actions.

b) A central question integrating more than one of the perspectives mentioned earlier would be: How can formal as well as informal institutions within a megacity be utilised to build a more balanced socio-ecological system? Researchers will have to identify examples of good practices to provide a knowledge base for decisionmakers.

c) Finally, there are still many questions open within each of the three perspectives on megacities. For instance, how can formal and informal institutions be linked in order to keep the strengths of both types, while at the same time eliminating their weaknesses? And what new forms of urban governance would this require?

These few examples are to illustrate the need for further scientific work on the resilience and the vulnerability of megacities. The research agenda opening up through the framework calls for a concerted interdisciplinary collaboration.

# Research on (Mega)Urbanisation, Vulnerability and Resilience

In Germany three major funding organisations have initiated programmes for concerted megacity research. The three programmes have different foci and are currently in their main funding phase.

- The German Federal Ministry for Education and Research (BMBF) announced the programme "Research for Sustainable Development of the Megacities of Tomorrow". Finding applicable solutions in the local contexts of cities in Latin America, Africa and Asia is strongly emphasised: www.emerging-megacities.org

- The Helmholtz Association initiated a research initiative under the title "Risk Habitat Megacity." Interdisciplinary research is carried out in Santiago de Chile in order to generate decision making knowledge: www.risk-habitat-megacity.ufz.de

- The German Research Foundation (DFG) set up a priority programme named "Megacities-Megachallenge: Informal Dynamics of Global Change." With the aim to develop theoretical approaches, especially with regard to informal processes, research is undertaken in the Pearl River Delta, China and in Dhaka, Bangladesh: www.megacities-megachallenge.org

On the international level several organisations have recently highlighted the issues of urbanisation and megaurbanisation.

- The United Nations provide background information and scenarios on global urbanisation. Especially the "World Urbanisation Prospects" (with the 2007 revision providing the most recent figures) and the report on the "State of the World Population 2007 – Unleashing the Potential of Urban Growth" highlight the impact of the urban turn: www.un.org/esa/population and www.unfpa.org/swp

- The International Human Dimensions Programme (IHDP) of the International Council for Science (ICSU) drafted a programme on "Urbanisation and Global Environmental Change". Under this programme, four major research themes related to the ongoing urbanisation process and its interconnections with environmental change are addressed: www.ugec.org

- In a first Research Prospectus on urban resilience the "Resilience Alliance" calls for detailed inquiry of metabolic flows in cities, social dynamics related to urbanisation, analysis of governance and networks, as well as for an analysis of built environments: www.resalliance.org

- The International Geographical Union (IGU) created the "MegaCity TaskForce" to apply geographical expertise to problems of Megacities: www.megacities.uni-koeln.de

proposals

## TOWARDS MEGACITY RESILIENCE – POLICY RECOMMENDATIONS

Based on the state of the art research, Folke et al. (2002, 2003) draw attention to four factors for successful resilience building:

- Accepting the fact that change and uncertainty are the norm. Policymakers should make use of the window of opportunity that is opening up and direct change into a sustainable direction.
- Diversity acts as insurance for a system's ability to function for reorganisation and renewal. Therefore policies should aim at nurturing diversity.
- Knowledge enables stakeholders to make informed decisions. Combining different types of knowledge is a precondition for innovative and resilient solutions under conditions of uncertainty.
- Self-organisation is the key feature of successful adaptation. A societal frame which facilitates self-organisation should therefore be a cross-cutting issue of policies.

These four basic assumptions can be applied within the three perspectives of the Megacity Resilience Framework. Based on this combination, the following policy recommendations were developed:

### 1 The Global and the Local

- Megacities are hubs of glocal networks where events happening far beyond the city's limits can have major impacts on the city and its population. In a state where change and uncertainty is the norm, policymakers must be prepared for the unexpected. This includes fostering the development of change indicators and early warning signals for crisis, as well as the coordinated implementation of effective higher level monitoring systems, which can be a vital insurance to cope with the unexpected and reduce vulnerability.
- Events on the global scale have an impact on the local level. These influences become more severe and will occur more often in a continuously globalizing world. The answer to these must be new forms of governance that are fit to these circumstances. Self-organization is one answer to account for external drivers. Governance linking the global and the local scale should rely on polycentric management systems and employ adaptive assessment and management strategies.

### 2 The Formal and the Informal

- The variety of institutions and people acting in the formal-informal continuum of megacities reflects an enormously rich diversity. Different elements of the complex mega-urban system have different memories providing a high potential to maintain functioning when changes occur. These different memories of various actors in the formal-informal nexus can lead to positive changes if disturbances occur, while the same impact might lead to severe consequences when these memories are neglected.
- Experience with change and uncertainty, as well as successful coping with disturbances and crisis, is captured by social memory. Therefore a context has to be developed that allows for drawing on social memory of various kinds to broaden decisionmakers' knowledge base. Policies should identify and support key functional groups for the sustenance and accumulation of social memory.

### 3 The Social and the Ecological

- Socio-ecological diversity is a major precondition to cope with adapting to uncertainty and surprise. It provides a mix of components whose history and accumulated experience help to cope with change, and facilitate redevelopment and innovation following disturbance and crisis. Policies should therefore seek to maintain and enhance socio-ecological diversity of megacities.
- People living in megacities and managing their lives within this complex system are an invaluable source of knowledge. Their lore is of an experiential nature, which is often not valued by decisionmakers, who try to follow "universally true" scientific findings. In opposition to the latter, local knowledge of socio-ecological systems is constantly changing – one could say adapting – and reflects broad experiences in managing the local environment. A combination of both knowledge types will allow for a sound policy shaping in the specific mega-urban context.

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## ABOUT THE MRF CHAIR ON SOCIAL VULNERABILITY AT UNU-EHS AND ITS SUMMER ACADEMY

### THE DEVELOPMENT OF THE MEGACITY RESILIENCE FRAMEWORK

Within its programme 'From Knowledge to Action', the Munich Re Foundation (MRF) has been providing financial support to the MRF Chair on Social Vulnerability at the UNU-EHS since 2005.

The objective is the in-depth exploration of different dimensions of social vulnerability. One of the main activities is the annually held Summer Academy on Social Vulnerability. The summer academy provides a forum for young scientist and international experts for an intensive exchange of ideas around themes related to social vulnerability. The Megacity Resilience Framework is a major output of discussions between participants of the 2nd Summer Academy "Mega Cities: Social Vulnerability and Resilience Building", which took place at Schloss Hohenkammer, Germany, from 22-28 June 2007.

This Policy Brief is based on the paper "The Megacity Resilience Framework" published in the UNU-EHS series SOURCE No. 10/2008. The paper, summarizing the discussions at Hohenkammer, was jointly written by:

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Mara-Daria Cojocaru presenting the framework to the participants of the summer academy. © Munich Re Foundation archive

Additional reading on Megacities:

Warner, K.; Bohle, H.-G. (2008): Megacities. Resilience and Social Vulnerability. SOURCE No. 10/2008. UNU-EHS. Bonn.

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Established by the U.N. General Assembly in 1973, the United Nations University (UNU) is an international community of scholars engaged in research, advanced training, and dissemination of knowledge related to pressing global problems. The United Nations University created the Institute for Environment and Human Security (UNU-EHS) to address risks and vulnerabilities that are the consequence of complex - both acute and latent - environmental hazards. It aims to improve the in-depth understanding of the cause-effect relationships to find possible ways to reduce risks and vulnerabilities. The institute is conceived to support policy and decision makers with authoritative research and information. UNU-EHS is supported by the German Federal Ministry of Education and Research and the Ministry of Innovation, Science, Research and Technology, State of North Rhine-Westphalia, both dedicated to promoting sustainable development and advancing human security. UNU-EHS aims for academic excellence in principal priorities of its programme:

- Vulnerability assessment, resilience analysis, risk management and adaptation strategies within linked human-environment systems; and
- Internal displacement and trans-boundary migration due to environmental push-factors;

whereby the major drivers such as land degradation, desertification, natural hazard events, gradual human-induced and natural environmental and climatic change and variability, including water depletion and quality deterioration are considered. Preparedness, adaptation, and response are the main dimensions along which human security can be strengthened. A special work focus of UNU-EHS is to conduct research on water related hazards along big rivers and on deltas. In addition, on behalf of the United Nations University, UNU-EHS is actively engaged in the activities of the International Flood Initiative (IFI) which focuses on research, information networking, education and training, empowering communities, and providing technical assistance and guidance.

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