Megacities

Our Global Urban Future

Frauke Kraas
Surinder Aggarwal
Martin Coy
Günter Mertins (Eds.)

IUGS International Union of Geological Sciences

IGU UGI

UNESCO United Nations Educational, Scientific and Cultural Organization

MegaCity TaskForce International Geographical Union (IGU)

planetearth Earth Sciences for Society

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Megacities

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Editorial: Megacities: Our Global Urban Future

Since the year 2007, according to the United Nations, more than half of the world's population live in cities – an increase from 30% in 1950 to 51.6% in 2000 – and the increase will probably reach 60% in 2030 (UN 2011). Urbanisation is proceeding rapidly, currently particularly in Asia and Africa. In the industrial North, urbanisation has slowed down and urban transitions have matured, except in the transition countries of industrialising Eastern Europe. The Asian region (in particular China and India with urban population weight of 700 million) sharing 75% of the developing countries' and 53% of the global urban population will remain the major contributor to future urban growth. Megacities as cities with more than five million inhabitants are most significant in this worldwide process of urbanisation. Almost 60 of them, with together more than 600 million people, are expected to exist by 2015. They are characterised by new development dynamics as well as intense and complex interaction of different demographic, social, political, economic and ecological processes. Many urban processes take place simultaneously, thereby often reinforcing themselves. In the developing world, megacities, population grows faster than the infrastructure. A fragmented and uncontrolled urban sprawl can foster high traffic volumes, high concentrations of industrial production, ecological overload, environmental degradation, informality and unregulated land development and property/housing markets. Both convergence and divergence forces are operating simultaneously to produce concentrated and highly differentiated and fragmented urban landscapes. Megacities often contain a mix of coexisting people: there are commonly groups with their own distinctive ethnic, community, cultural roots, lifestyles and social *milieux*. Differences in economic development, social polarisation, quality of infrastructure and governance must be recognised and taken into account.

Against this background, this book intends to take a closer look at selected mega-urban questions and case studies. It is directed to important dynamics and challenges of mega-urban development worldwide by focusing on three main topics, i.e. (1) physical space, land and resources; (2) economic, social and infrastructure transformation; and (3) governance and management of and in megacities.

At first, a general overview of major trends and global considerations aims at summarising important processes and challenges in mega-urban areas worldwide (contribution of Frauke Kraas and Günter Mertins). It points out major developments and trends and emphasises the complexity of interwoven processes of mega-urban regions.

In the *first part* of the book, focusing on *Physical Space, Land and Resources*, Bernd Hansjürgen and Dirk Heinrichs give a broad overview over the key challenges in respect to climate change – similarly as Eduardo de Mulder, Jacques Besner and Brian Marker summarise problems and options of using additional spaces in underground cities. In regard to the situation of rapid mega-urban development in China, Rafiq Azzam and co-authors in their research contribution focus on the problems of water quality and socio-economic vulnerability that arise from the massive influx of migrants into the emerging megacities. Forms and problems of ensuring the mega-urban food supply in Dhaka/Bangladesh are looked at closely in the paper from Markus Keck and co-authors. The contribution of Babette Wehrmann points out the important issue of land development strategies in the context of urban sprawl and informality, while the influence of foreign direct investment on land use changes and regional planning is elaborated in the chapter by Margareth Pugh O'Mara and Karen Seto. All chapters in this part of the book open the view for a critical perspective on the shortages of land and resources under the high pace of mega-urbanisation.

The deep and far-reaching *Economic, Social and Infrastructure Transformation of Mega-Urban Regions* is focused at in the *second part* of the book. Martin Coy and Tobias Töpfer investigate the diverse inner-city development in Latin American megacities in context to degradation and renewal. Agile firm organisation and upgrading processes in the Pearl River Delta, China, are dealt with in the contribution from Wan-Hsien Liu and co-authors. Tabea Bork-Hüffer and co-authors focus on the transformation of international migration patterns in Guangzhou and Foshan. A critical assessment of growing violence, fear and fragmentation is undertaken by Marcelo Lopes de Souza for the case of Rio de Janeiro, Brazil. Alexandra Hill and co-authors focus on informal processes of urban expansion and technical infrastructure in Dar es Salaam, and Jan Marco Müller assesses closely the bus rapid transit system of the TransMilenio in Bogotá as possible example for infrastructural problems in megacities worldwide.

The *third part* of the book directs the reader to questions of *Governance and Management* in mega-urban regions. Shipra Narang-Suri and Günter Taube elaborate on experiences, challenges and implications for international cooperation in megacities. Werner Gamerith focuses on planning processes in New York City, and Christoph Dittrich compares e-Governance initiatives in India, taking up the examples of Hyderabad and Bangalore.

All contributions show the necessity of international, interdisciplinary collaboration in addressing complex research questions of mega-urban development. They also prove the imperative to include and connect major stakeholders, ranging from local governments, private enterprises, non-governmental organisations to the civil societies, in order to understand and analyse current developments and achieve good practices for a more sustainable performance of mega-urban governance.

This book combines contributions which originated from several initiatives within the growing community of researchers working on megacity issues. Among the first was the conference series on megacities in 2002, organised by the Konrad Adenauer Foundation (documents of this conference can be

downloaded at http://www.kas.de/wf/de/21.116/). Furthermore, the International Geographical Union's MegaCity TaskForce brought together researchers from all over the world, forming a transglobal, multidisciplinary network of scholars and practitioners exchanging knowledge, expertise and solution-oriented good practices worldwide (www.megacities.uni-koeln.de). The later development of three complementing research programmes which focus on key issues of megacity development has contributed strongly to deeper knowledge on and comparative analysis of mega-urban realities. These are, namely, (1) the German Ministry of Education and Research (BMBF) programme's "Research for the Sustainable Development of the Megacities of Tomorrow" (2005–2007), which later was renamed "Future Megacities – Energy- and climate-efficient structures in urban growth centers" (2008–2013; www.future-megacities.org); (2) the Priority Programme of the German Research Foundation (DFG) on "Megacities – Megachallenge: Informal Dynamics of Global Change" (2006–2013; www.megacities-megachallenge.org); and (3) "Risk Habitat Megacity" (2007–2011; www.risk-habitat-megacity.ufz.de) of the Helmholtz Association, which later transformed to "ClimateAdaptationSantiago" (2009–2012; www.climate-adaptation-santiago.ufz.de). Last but not least, over the International Year of Planet Earth (IUGS & UNESCO), one of the key topics was "Megacities – our global urban future" – this volume is a direct product of the activities during this global initiative.

The editors would like to sincerely thank first and foremost all the authors of this volume for their strong engagement, commitment and patience over its development period. Special thanks go to Dr. Günter Dill and Ulrich Nitschke for leading the first megacity conferences, to the members of the MegaCity TaskForce of the International Geographical Union (IGU) for their continuous support in the scientific development of the topic and in approaching several of the authors of this volume and to the chairs of the International Year of Planet Earth, in particular Eduardo de Mulder, as well as the publisher Springer for their always generous and very helpful support of the publication. We also reserve special thanks to Ursula Dörken, Rebeca Niemann and the staff at Springer for the reliable help in proofreading of the contributions.

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Megacities and Global Change

1

Frauke Kraas and Günter Mertins

Abstract

Megacities, due to their enormous population concentrations and rapid development dynamics, are gaining more and more importance as junctions of globalisation processes and governance centres in a world increasingly dominated by cities. Megacities are not just large cities. Their scale creates new dynamics, new complexity and new simultaneity of events and processes – physical, social, political and economic. A multitude of drivers, driving forces and actors as well as interacting and partially self-enhancing acceleration and feedback effects is further contributing to the complexity of their development dynamics.

Keywords

Megacities • Global change • Governance • Informality

Megacities are influenced by the manifold processes of global change, and they also co-determine it vice versa (Kraas 2003, 2007; Gurjar and Lelieveld 2005; Borsdorf and Coy 2009). In general, megacities are globally viewed more as risk areas (Mitchell 1999; Kraas 2003), where environmental pollution, symptoms of capacity overloads and stress, resource consumption, natural and human-made risks (e.g. inundation, earthquakes, storms, water shortage, economic crises, ethnic-religious conflicts and industrial accidents) endanger the functioning of mega-urban economies and societies (McGee 1991; Mertins 1992; McGee and Robinson 1995). In particular, disadvantaged population groups in megacities are subject to increasing poverty and vulnerability (Mertins 2006; Bohle and Sakdapolrak 2008; Bohle et al. 2008) and socio-spatial segregation and fragmentation processes (Mertins and Müller 2010); in addition, socioeconomic disparities and disintegration are worsening. However, the positive development chances inherent in megacities as global junctions should also be perceived (Ehlers 2006): There is substantial potential due to the wide range of available financial and human resources as well as widely networked and interacting stakeholders, especially

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as pioneers on the way to sustainable development, for instance, through decreasing spatial consumption per capita, efficient resource use or improved education and health care (Krämer et al. 2011; Bork et al. 2011a, b). Furthermore, technical innovations in megacities can be realised cost-efficiently and integrated in the existing structures (e.g. transport systems, networks, process innovations; Herrle et al. 2006).

1.1 Megacities: Definitions and Dimensions

Megacities are usually defined according to quantitative criteria and are thus – in accordance with various definitions – metropolises with five, eight or ten million inhabitants (Mertins 1992; Fuchs et al. 1994). In general, these cities have a mono-centric structure (Bronger 2004). However, polycentric mega-urban regions as functionally integrated, interacting agglomerations are also included, e.g. the Pearl River Delta in Southern China or the Rhine-Ruhr Area, Germany.

While seven megacities (with more than five million inhabitants) existed in 1950 and 24 in 1990, by 2010 there were 55 and by 2025 there will be – according to estimations – 87 megacities (UN 2012; Fig. 1). Currently, megacities in Asia are facing the world's most dynamic changes. Due to high urbanisation rates (up to about 5%/a), the degrees of urban population compared to the total national population have clearly climbed in the last three decades (UN 2012). Highest growth rates are due to natural population growth, especially however due to migration and administrative incorporation of urban territory. International and/or national migration modifies this, as do temporary, circular or seasonal migration with respect to underemployment and landlessness in rural areas.

However, purely quantitative delimitations based on population numbers remain unsatisfactory, since the statistical values are based on nonuniform surveys from different spatial administrative regional divisions. More essential are the qualitative characteristics of the megacities, among which – with considerable individual differences between megacities in industrial, emerging, transition and developing countries – are a series of frequently observed similarities. Among these are intensive expansion, suburbanisation and inner-urban consolidation processes, functional primate city dominance as well as symptoms of ecological and infrastructural capacity overloads and stress, diversification of inner-urban centre structures, development of polarised or respectively, fragmented societies and increasing loss of governance and control with increasing informality (Roy and Alsayad 2004; Qi et al. 2007; Kraas and Mertins 2008; Mertins and Müller 2010). Some megacities are also global economic governance centres and global cities with high-ranking services as well as headquarters of transnational businesses that produce for world, national and regional markets.

1.2 Megacities: Contributing to and Affected by Global Change

Above all, globalisation processes were and are the motors that drive these enormous changes and are also the driving forces, together with transformation and liberalisation policies, behind the economic developments of the last ca. 25 years (in China, especially the so-called socialism with Chinese characteristics that started under Deng Xiaoping in 1978/1979, in India essentially during the course of the economic reform policies of the so-called New Economic Policy as of 1991; Cartier 2001; Nissel 1999). Especially in megacities, these reforms led to enormous influx of foreign direct investments, to intensive industrialisation processes through international relocation of production locations and depending upon the location, partially to considerable expansion of the services sector with increasing demand for office space as well as to a reorientation of national support policies – with a not to be mistaken influence of transnationally acting conglomerates but also considerable transfer payments from overseas communities. In turn, these processes are flanked and intensified

through, at times, massive migration movements of national and international migrants into the megacities (Baur et al. 2006).

Globalisation processes also cause or amplify three central developments, which are characteristic for many megacities with current high dynamics: (1) How vulnerable the population of a megacity, as well as its social and economical system, with respect to extreme or shock events is, is considerably dependent upon how much extensive parts of the population rely on the public supply systems (food, water and energy, but also health-care and education facilities) or if they are neglected by the systems (Bohle et al. 2008; Bork et al. 2011a, b). (2) Strength and measures of public-administrative governance and steering, on the one hand, and capability and flexibility of self-organisation of civil society, on the other hand, cause to what extent informal, self-organised structures, and negotiation processes are or must be responsible for the development. Both stakeholder groups act all the more strongly the more intensively they are integrated in the superordinated globalisation processes: State and administration are strengthened, e.g. through foreign investments or development cooperation; local population and NGOs are supported through foreign connections in their capacities and actions and thus have enhanced legitimation and negotiation margins. (3) Problems of governance and steering are also directly connected to globalisation processes: For example, the financial resources of a megacity accrue from the economic capacity and international competitiveness of its urban economy; the political direction of the governing powers contributes to international legitimation and financial support of the steering instruments.

Thus, the dynamics and complexity of the processes that take place in megacities as well as their impact upon the reorganisation of global spatial, sociocultural, economical and political-institutional relationships belong to the greatest challenges of our time. Historically, the processes connected with today's mega-urbanisation can only be compared with the profound changes that occurred as a result of the Middle European and North American industrialisation of the 19th and 20th century – if their importance is not clearly exceeded, especially with respect to the current, enormous mega-urbanisation dynamics in the populous countries of South, East and Southeast Asia and the global shift of production and services.

1.3 Governance and Informality

Some of the most critical deficits in megacities include overall weak governability and steering structures in the administrations with a prevalence of, for the most part, vertical governance, low inter-institutional horizontal networking and coordination as well as weak steering competency of the administrations (UN-Habitat 2002, Kreibich 2010). In addition, the dominance of, for the most part, sectoral planning with a simultaneous lack of integrated urban or regional planning and effective land-use planning and controls as well as binding construction plans with regulations for building and construction standards (e.g. storey heights, infrastructure equipment or safety measures) is a problem. An additional aggravating factor for all administration procedures is that there are different borderlines and thus competencies of administrative units within the megacities. Correspondingly, extensive areas of many megacities are characterised by uncontrolled, very heterogeneous land-use mosaics that are directly next to each other. Furthermore, there are at times striking bottlenecks in the provision of everyday basics, especially with respect to drinking water and electricity supplies, basic health care and emergency and catastrophe precautions.

While urban policy – seen against modern concepts of "governance" and "government" – is more and more viewed as a multilevel system, "since the borders of the state have been dissolved with respect to society as also international surroundings" (Benz 2004: 5) and new stakeholders are influencing development processes, a new complexity of political processes and structures in international system can be observed.

Due to strong economic dynamics and high immigration figures in many megacities, housing, infrastructure, jobs, supply and disposal systems as well as health care and education must be provided for hundreds of thousands, often within a few years. Naturally, the struggle for urban livelihood and reduced steering capacities supports regulation regimes where informality prevails (Hackenbroch et al. 2009). Insufficient or a lack of developmental and land-use planning and control as well as increasing loss of governance and administration capacities have an effect on the administration, organisation, planning, control and management of municipal tasks – with the result that many processes are unregulated, informal or illegal (Roy and Alsayad 2004; Kreibich 2010). Thus, a substantial and, in part, increasing amount of informal structures and processes can be observed beyond state-registered and state-regulated activities. Within the wide range of the informal economy, these include, e.g. domestic help, street hawkers and cook shop operators, as well as unregistered workers in transport and repair sectors, travelling hawkers, waste collectors and informal vendors (Kulke and Staffeld 2009). Earlier perceptions of the informal sector, as a sector that absorbs the masses, are being questioned because of the informal sector's adaptation capabilities and flexibility. Current discussions address the question as to whether and how much the informal sector in megacities will be able to realise their necessary survival absorption functions due to erosion of local supply cycles due to internationalisation of the markets (Bohle et al. 2008). Moreover, phenomena like conceded or experimental informality can be identified.

Beyond this essentially economically focussed perception, present concepts of informality include aspects such as informal construction, personal arrangements in personal networks as well as unregulated, semi-legal and illegal activities. The transitions of different socioculturally interpreted understandings of legitimacy, legality and illegality are not necessarily sharp, especially since at times competing legal systems can coincide as anchors of informal organisations. In addition, the polarising paired concept of formal and informal, in which the distinguishing criterion is state participation, has been found inadequate because it displaces the realities of the varied stakeholder interconnections. In addition to stakeholders in formal political-administrative systems and the private sector, self-organised networks and institutions are establishing themselves increasingly, and their complex governance mechanisms, negotiation processes and discourse influence the development dynamics of megacities. Especially a look at administrative governance capacities shows that conventional concepts, standards, strategies, tools and priorities of megacity development neither do justice to conditions of current urbanisation dynamics nor are suitable for adequately integrating the complexity of the stakeholders – also they have to be reconsidered under the auspices of global change.

1.4 Key Priorities for Research and Practice

The general perception of mega-urban regions, the international megacity research as well as the priorities in planning and governance are currently undergoing substantial changes: First, megacities are perceived more and more as areas of global importance, affected by and affecting themselves manifold levels of global change over wide distances and long periods of time. Consequently, their performance falls no longer just in the responsibility of local actors, but as they are embedded at least in transnational, if not global development processes, the responsibility for their sustainable development lays in the hands of numerous, more or less directly or indirectly responsible, internationally connected actors. Second, the general perception of megacities shifts from a predominantly negative view ("moloch", "global sink") to a more positive perception of mega-urban areas as priority areas and drivers of change, with at least often undiscovered potential of improved sustainability and quality of life for many, at least more, if not all inhabitants. Third, the complex reality of phenomena, processes and actors as well as the

high pace of development in mega-urban areas inevitably deserve international, inter- and trans-disciplinary, intercultural as well as multi-stakeholder-oriented research and action – including stakeholders from research, administration, the private sector and the general public and civil society. This necessarily implies a more engaged and committed interaction among all responsible levels. Fourth, as to the role and direction of research, the generation of not only knowledge based on fundamental descriptions, analyses and explanations but, moreover, the creation of knowledge for prediction, orientation and decision making are needed. Fifth and finally, for many megacities, particularly in the emerging economies, major shifts from a predominantly globalisation-driven, competitiveness-seeking top-down development to alternative priorities, such as of region-based and spatial transformations (Pain 2010) are regarded important. Beyond current priorities on structure-, pattern-, land-use-, infrastructure- and housing-based planning, more problem-, process- and people-oriented approaches are emerging.

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Part I

Physical Space, Land and Resources

Megacities and Climate Change: Early Adapters, Mainstream Adapters and Capacities

2

Bernd Hansjürgens and Dirk Heinrichs

Abstract

In this chapter, the relationship between the necessity of making urban adaptation responses to climate change and the competences and capacities in megacities is analysed. The experience of early adapters (cities that have already initiated local adaptation strategies and plans) reveals that these cities are able to seize several opportunities. These include the political recognition as local champions, innovation of local administration (e.g. by creating cross-departmental working groups and units), the development of new networks, the creation of new knowledge and the formation of strong and broad political consensus on development priorities that support and confirm existing strategies. However, these determining factors do not necessarily work for potential later adapters and, in particular, for megacities. They are either case-specific or exclusively available for early movers only and will no longer apply to mainstream adapters. Some other factors are of instructive value to mainstream adapters as good practice, for example, those relating to accommodating the integrative cross-cutting nature of climate change in the implementation arrangements. The diffusion of adaptation action to megacities will rely to a great extent on mobilising potentials and overcoming obstacles with respect to a range of political, financial and administrative competences and capacities. However, many megacities around the world suffer from significant deficits with respect to these capacities and competences. These shortcomings are probably among the causes for the fact that initiatives towards strengthening adaptation action are still the exception rather than the rule.

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2.1 Introduction

Since the release of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC-AR4), we know that the change of the globally averaged temperature is undisputable. We also know that it is *very likely* (90–99% chance) that global warming is caused primarily by anthropogenic activities. It is *very likely* that temperature extremes, warm spells and heat waves will continue to become more frequent in most areas; it is *likely* that the areas affected by droughts will increase and that tropical cyclones will become more intense, with higher peaks of wind speed and heavy precipitation (IPCC 2007a; Fragkias 2009). The IPCC Fourth Assessment Report does not contain any new or surprising results. Instead, it confirms the statements of its predecessors and underlines the fact that there is now more scientific evidence and a higher likelihood that negative climate change impacts will occur.

Megacities are part of the story as a cause of global climate change. Because they concentrate large portions of the urban population, major shares of their countries' economic activities as well as the consumption of food and natural resources, megacities are a major source of anthropogenic greenhouse gas emissions. Large cities are responsible for a significant share of the greenhouse gases released into the atmosphere. As 80–90% of future population growth is expected to occur in megacities, especially in the agglomerations of the global South, megacities' greenhouse gas emissions into the atmosphere will contribute considerably to the increase of total greenhouse gas concentrations. Therefore, the success of greenhouse gas mitigation strategies will depend crucially on whether cities are included in the response to climate change issues by developing and applying greenhouse gas mitigation strategies, in particular, in the fields of urban housing and buildings, energy supply and demand and urban traffic.

However, megacities are also affected by global climate change. Many megacities are located in climate-sensitive areas, and their growth is in particular predicted to occur in these areas. Therefore, risks associated with climate change will rise in areas where megacities are located, for example, coastal areas, flood-prone areas or areas suffering from water scarcity and droughts. What is more important is that many megacities are not only exposed to climate change risks but also concentrate large numbers of the most vulnerable parts of the population. The world's urban population is likely to reach more than eight billion by 2020, and the urban slum population is expected to increase to 1.4 billion by this time. This means that one out of three persons living in cities will live in slums under impoverished, overcrowded and insecure living conditions. This also means that these people comprise individuals and groups which are extremely vulnerable to the impacts of global climate change, such as the poor, women, old-aged people, children, migrants or other groups suffering from segregation (Bartlett et al. 2009).

As climate change is to a large degree unavoidable, at least in the short and middle term, there is no chance for urban areas and their residents to escape from the predicted adverse climate change impacts. The retention period of greenhouse gas concentrations in the atmosphere is decades or even centuries. The world's current climate is influenced by the greenhouse gas emissions of the past, mainly by emissions of the industrialised countries since the beginning of industrialisation. Thus, climate change risks will increase even if the world manages to reduce the release of greenhouse gases into the atmosphere, for example, in the follow-up process of the Kyoto Protocol (which can be doubted). If mitigation measures have long time horizons before becom-