

Population Distribution, Urbanization, Internal Migration and Development: An International Perspective



United Nations
Department of Economic and Social Affairs
Population Division

DESA

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PREFACE

The geographical distribution of the population has undergone major changes in the past fifty years, and will continue to experience significant transformations during the coming decades. While the developed world became mostly urban around 1950, developing regions, including Africa and Asia, which are still mostly rural today, will have more people living in urban areas than in rural areas by 2030. Urbanization has brought a number of advantages to the national economies and opportunities for improving people's well-being, for poverty reduction and for the promotion of sustainable development, but it also brings serious challenges in many countries. Information and analysis are essential to understand these challenges and to assist policy-makers define, formulate and evaluate policies and programmes that address them.

The Population Division of the Department of Economic and Social Affairs of the United Nations organized an Expert Group Meeting on Population Distribution, Urbanization, Internal Migration and Development, which took place from 21 to 23 January of 2008 at the United Nations Headquarters in New York. The meeting brought together experts from different regions of the world to present and discuss recent research on trends and challenges of urban growth, internal migration, and population distribution, the linkages and disparities between urban and rural development, the challenges of climate change for the spatial distribution of the population, social aspects of urbanization, including its impacts on health, and aspects of urban planning and urban governance.

This publication includes selected papers presented at that meeting as well as two contributions prepared after the meeting. It brings to the fore some important new findings that can serve as the basis for well-informed policy recommendations, not only with respect to population distribution but also, more in general, with respect to social and economic development. Thanks are due to the experts who have contributed to this publication and to other participants to the Meeting who enlightened the discussions. Special thanks go also to the staff of the Population Division who helped organize the Meeting and in particular to Donna Culpepper, who assisted in editing and formatting this publication.

This publication can be accessed on the website of the Population Division at www.unpopulation.org. For further information about this publication, please contact the office of Ms. Hania Zlotnik, Director, Population Division, DESA, United Nations, New York, NY 10017, USA; tel. (1-212) 963-3179; fax: (1-212) 963-2147.

INTRODUCTION

For the first time in history, more people live now in urban than in rural areas. In 2010, urban areas are home to 3.5 billion people, or 50.5 per cent of the world's population. In the next four decades, all of the world's population growth is expected to take place in urban areas, which will also draw in some of the rural population through rural to urban migration. Moreover, most of the expected urban growth will take place in developing countries, where the urban population is expected to double, from 2.6 billion in 2010 to 5.2 billion in 2050. In developed countries, the number of urban dwellers will grow more modestly, from 0.9 billion in 2010 to 1.1 billion in 2050. During the same period, the world's rural population will decline by 0.6 billion.

The level of urbanization varies significantly across regions and countries. Europe, Latin America and the Caribbean, Northern America and Oceania are highly urbanized, with proportions urban ranging from 70 to 82 per cent in 2010. Africa and Asia remain mostly rural, with only 40 and 42 per cent of their population living in urban settlements, respectively. By mid-century, however, all regions will be mostly urban, indeed more than 60 percent urban, according to current projections.

The speed of urbanization is slower now than it was in past decades in all regions, largely because many countries have already reached high levels of urbanization. The rate of urban population growth is also declining and is expected to continue declining until 2050, although it is still very high in Africa, where the urban population was growing at an annual rate of 3.4 per cent in 2005-2010, and in Asia, where urban population growth averaged 2.8 per cent in the same period. Nevertheless, the absolute size of these increments is unprecedented: Africa gained an average 13 million additional urban dwellers per year in 2005-2010, and is expected to gain some 25 million per year in 2045-2050. Asia's urban population increased by 38 million per year in 2005-2010, and is still projected to grow by an annual 35 million in 2045-2050. During the same period, Africa and Asia will be losing 2.5 million and 27.3 million rural inhabitants per year, respectively.

Migration from rural to urban areas has historically played a key role in the rapid growth of cities and, together with the reclassification of rural localities into urban centres, it continues to be an important component of city growth. However, natural increase, that is to say, the difference between births and deaths on site, can contribute significantly to urban growth, particularly in countries where fertility levels remain high. Today, natural increase makes a larger contribution to urban population growth than internal migration and reclassification in the majority of developing countries (United Nations, 2009).

The current levels of urbanization are unprecedented and so is the number and size of the world's largest cities. In 1950, there were only two megacities, that is, cities with at least 10 million inhabitants, and five cities with populations ranging from 5 million to 10 million inhabitants. Today, there are 21 megacities, including 17 in the developing world. However, despite their visibility and dynamism, megacities account for less than 10 per cent of the world urban population. A majority of Africa's urban population lives in small cities (with fewer than half a million inhabitants) and so does Europe's. Urban dwellers in Asia, Latin America and the Caribbean and Northern America are more concentrated in large urban agglomerations, with about 20 per cent of their respective populations living in cities with at least 5 million inhabitants.

These transformations have been a major aspect, if not a driver, of economic development. Cities are focal points of economic growth, innovation and paid employment. On average, urban residents have better access to education and health care as well as other basic services such as clean water, sanitation

and transportation than rural populations. If well managed, urbanization can continue to offer important opportunities for economic and social development. However, the speed and scale of urbanization in developing regions challenge the capacity of Governments to adequately plan and meet the needs of the growing number of urban dwellers. As cities grow, managing them becomes more complex and their populations become more diverse. Developing countries will need to adjust to this process much faster than developed countries did in the past.

In order to discuss these trends and their implications for development, the Population Division of the Department of Economic and Social Affairs of the United Nations organized an Expert Group Meeting on Population Distribution, Urbanization, Internal Migration and Development from 21 to 23 January of 2008 at the United Nations Headquarters in New York. This publication is the outcome of that meeting, which brought together experts from different regions of the world to present and discuss recent research on trends and challenges of urban growth, internal migration, and population distribution, the linkages and disparities between urban and rural development, the challenges of climate change for the spatial distribution of the population, social aspects of urbanization, including its impacts on health, and aspects of urban planning and urban governance. The publication includes selected papers presented at the meeting as well as two contributions prepared after the meeting, and brings to the fore some important new findings.

One major challenge of contemporary and future urbanization derives from the fact that practically all urban population growth will take place in poor countries, and that a large proportion of the future growth of the urban population will live in conditions of poverty. The papers in **Part One** reflect on this and possible policy approaches to improve the capacity of cities to realize the potential benefits of urbanization. George Martine states that attending to the land and housing needs of the urban poor will have a positive impact on poverty reduction and will also make cities more sustainable. He also notes that the current patterns of geographic expansion of urban areas, which use more land than necessary and often encroach upon valuable agricultural sites, reduces the potential benefits of demographic concentration. Martine notes, in line with some new thinking on these matters, that urban concentration does not have to be a foe, but can constitute an important ally of environmental sustainability. Eduardo López Moreno's paper, dealing with the population living in slums, shows that one in three developing country urban residents currently lives in a slum. The proportion of slum dwellers is much higher in Africa, at 70 per cent of the urban population. According to López Moreno, countries that have succeeded in significantly reducing the slum population have launched advocacy campaigns to raise awareness, especially among local authorities; some have shown consistent political commitment over the years, and have backed such commitment with adequately monitored policies and institutional reforms. In successful experiences, countries have taken a coordinated approach, where central interventions have been further implemented by local authorities.

Part Two addresses internal migration, a key determinant of changes in population distribution and a major driving force in the process of urbanization. However, the magnitude and patterns of internal migration remain poorly documented in many countries, particularly in the developing world, because the data required to estimate internal migration from population censuses is not collected, or it is not published with sufficient detail. Countries in Latin America and the Caribbean constitute a notable exception, partly because of the efforts by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), which has become the regional repository of micro-census data. Using abundant information collected by ECLAC, Jorge Rodríguez analyzes the region's spatial distribution patterns and confirms that the process of urbanization is still on-going, although at a decreasing speed, given the already high proportions urban in the region. He shows that in Latin American and Caribbean, the flows from urban to rural areas are driven mainly by city sprawl, that is, by short-distance mobility from cities to their outskirts. The author also finds that internal migration declined from the early 1990s to around 2000, and that large social and economic inequalities across regions remain. Kam Wing Chan

explains the complexities of analyzing migration trends in China, where the *hukou* or household registration system prevails. The author uses a variety of data, both official statistics and estimates from the research literature, to estimate migration trends since the early 1990s. He shows that, while the proportion of *hukou* migrants over the total population has not increased, both the proportion and the number of non-*hukou* migrants from rural areas has grown steadily, to reach 140 million in 2008. Chan also finds that inter-provincial, long-distance flows have increased the most, and that origins have diversified over time. He ends his paper with an assessment of the inequalities associated to the *hukou* system and the impact it has on the economy as a whole and on non-*hukou* migrants.

The economic, social and environmental linkages between urban and rural areas are taken up in **Part Three**. These linkages have been recognized and studied in the academic literature, but in formulating regional policies, the interdependence of rural and urban growth and development is often ignored. In exploring the links between urban and rural development in Africa and Asia, Cecilia Tacoli notes that income from non-farm activities, often earned in cities, is vital to rural households and small-scale farming. Despite the commonly held negative view of rural-urban migration in developing countries, remittances have an important impact on the economies of villages and small towns. Tacoli also observes that domestic urban markets are more stable than export markets and stimulate production by small-scale farmers, who can respond rapidly to changes in consumer preferences. Other contributions in Part Three draw attention to the blurring of the rural-urban divide, as urban functions are being spread over increasingly large geographical areas. In the context of Europe, Anthony Champion indicates that the economic, social and even environmental differences between urban and rural areas have almost disappeared. In addition, infrastructural improvements allow people to move to rural areas surrounding cities without losing access to the cities' jobs and services. He finds that, while overall urban population growth has declined in the United Kingdom and in many other European countries since the 1970s, growth in the largest cities has accelerated again since the early 2000s. But the nature of peri-urban growth in Europe is very different from that observed in Latin America. Haroldo da Gamma Torres notes that suburban growth in Central and South America is explained mostly by the expansion of shantytowns and illegal settlements, and that access to social services, sanitation and infrastructure is significantly worse in peri-urban areas than in central cities. Torres explains how the right zoning, transportation and housing policies could influence such expansion and lead to a more sustainable use of space.

In the coming decades, population distribution and urbanization will face new challenges from a changing environment and will, in their turn, affect climate change. Two papers in **Part Four** analyze the impacts of climate change on migration, population distribution and urbanization. They confirm that climate change will cause significant disruptions in the livelihoods of those affected and can, therefore, lead to significant increases in mobility. However, as Susana Adamo and Alexander de Sherbinin explain in their literature review, estimating the potential magnitude of environmentally-induced mobility, anticipating whether it will be temporary or long-term, whether those who move will do so internally or across borders, are very difficult to ascertain. Adaptive capacity and vulnerability to climate change are influenced by non-environmental, that is to say, social, economic and political factors which are hard to predict. In some cases, moving will be one among several options while, in others, mobility will be the only choice. Populations in coastal areas, for instance, will be affected by increased risks of seaward hazards and the gradual sea-level rise, and migration will be a necessary response to such risks. Deborah Balk's assessment shows that low-elevation coastal zones -less than 10 meters in altitude- account for two per cent of the world's land but are home to 10 per cent of the world's population, and represent 13 per cent of the urban population. In addition, the population in these zones is growing rapidly. Thus, sea-level rise is likely to have a strong impact on the spatial distribution of the world population, and will disproportionately affect urban dwellers in developing countries.

Climate change is also likely to affect the availability of natural resources. Whether resource scarcity will lead to an increase in armed conflicts is a matter of debate. The main conclusion from a set

of studies undertaken by Henrik Urdal at the cross-national and national levels, is that high ratios of population to productive land and fast population growth do not make countries more susceptible to armed conflict. A detailed study of India, however, indicates that scarcity of productive land is associated with higher risks of political violence in this country. Urdal wonders whether the lack of internationally comparable data makes cross-country studies less reliable than in-depth analyses at the national and sub-national level.

The ecological impact of cities is not limited to their local environment, but has a regional and even global reach. In the last paper of this part of the volume, Peter Marcotullio explains that as societies become wealthier, the local environmental impact of urban areas becomes less visible, while their regional and global impacts grow. He also shows that, in Asia, urban environmental challenges are emerging at lower levels of income and are evolving faster than they did in developed countries in the past.

In developing countries, rapid urbanization in the coming decades will have profound implications for health, as documented in **Part Five**. This will affect both service delivery and the health risks faced by increasingly urban populations. Overall, urban dwellers have a clear health advantage over populations in rural areas. However, as the papers in this part illustrate, urban populations are very diverse and so is their vulnerability to health risks. Mark Montgomery shows that the health status of poor women and children in urban areas is similar to that of the rural population as a whole, and their use of health services is almost as limited. Since private for-profit care is a significant presence in most cities and health care is highly monetized, the urban poor without significant cash income find themselves unable to use modern hospital or well-trained health professionals, according to Montgomery. Both his paper and that by Jean-Christophe Fotso, Nyovani Madise, Alex Chicka Eze and James Ciera emphasize the importance of access to safe drinking water and adequate sanitation for improvements in the health of the urban poor. This paper also shows that, in sub-Saharan Africa, countries with rapid rates of urban population growth have not been able to increase urban child vaccination coverage, and have seen urban child mortality stagnate or decline very slowly. Failing to improve the living conditions and the health status of the growing number of urban poor will put countries further away from attaining the health-related Millennium Development Goals.

In an increasingly urban world, the proper management of cities is essential to eradicate poverty and to achieve all other development goals, yet urban governance is an ever more challenging task. Over half of the world urban population lives and will continue to live in small cities, where existing coverage of basic public services and infrastructure are far from comprehensive (Montgomery and others, 2003). With decentralization, solutions to urban problems are increasingly sought at the local level but, often, local governments do not have the capacities needed to address them.

This is not only the case in small cities, but also in larger urban agglomerations, as explained in **Part Six**, which addresses urban planning and governance issues. Indeed, many megacities are expanding rapidly into complex and dynamic mega-urban regions but, as Aprodicio Laquian notes, the political and administrative capacities to govern them are not growing as fast. Fragmentation of local municipalities within these regions, lack of local revenue, insufficient public participation, and lack of transparency and accountability are some of the shortcomings of mega-urban region governance, according to Laquian. Inclusive and sustainable development of mega-urban regions requires participation by all sectors of society and all levels of government. One example analyzed in some detail in this volume by Mee Kam Ng is that of the Pearl River Delta region of China, which constitutes an urban region that has experienced vast geographical expansion and impressive economic growth, although along a path that does not seem to be sustainable in the medium or long-term. The author explains how successive urban

system plans have not engaged key stakeholders, including some local authorities, to pursue long-term sustainable growth.

Climate change brings additional challenges to urban governance. Although urban populations in developing countries are most at risk from the impacts of climate change, the institutional basis for adaptation to climate change in these countries is weak. David Satterthwaite describes the interventions needed at the local level to adapt to climate risks, namely: to develop an information base on historical and current conditions that would allow to undertake detailed local risk/vulnerability assessments, and to move from assessment to action, supporting low-income groups in particular. Satterthwaite notes that official development assistance agencies are not set up to support the kind of long-term engagement needed to enhance local adaptive capacity. The design of local and city adaptation programmes of action could provide a platform for cities to receive external support, according to the author.

In sum, the papers in this volume emphasize the importance of planning ahead for an urban future. Even though urbanization offers significant opportunities for poverty eradication and for the promotion of sustainable development, adequate planning is necessary to reap the potential benefits of urbanization and lessen its costs and negative side-effects. Of particular concern of most contributions to this volume are the implications of urban population growth in developing countries for the well-being of both urban and rural populations. The evidence they provide suggests that urban growth has done more to reduce rural poverty than to reduce urban poverty, and that the growth of domestic urban markets appears to be key to rural development. Migrants from rural areas gain access to better opportunities in cities and families left behind benefit from their remittances.

Many Governments are concerned about high urban population growth and have acted on this concern by adopting measures to try to reduce or even reverse rural to urban migration flows. Most of these measures have had little success, mainly because individuals have powerful incentives to move in order to improve their standard of living. And because the main component of urban growth is natural increase, improving access to family planning and addressing other basic social needs of all urban dwellers is a better way to confront the negative effects of fast urban population growth. Developing and supporting the capacity of local authorities to address these needs is, according to this volume, a pressing requirement.

Effective governance and planning, including the capacity to properly monitor the urbanization process and the growth patterns of individual cities requires more systematic and detailed data. Many local governments in the developing world lack information on poor informal settlements or slum growth, and most official statistics do not adequately register the poor or where they live. Spatially disaggregated data, in particular, are indispensable to understand local realities and thus inform policy and planning, especially in light of the new challenges brought about by climate change and global interconnectedness.

Part One
Urban growth: Global trends and challenges

PREPARING FOR SUSTAINABLE URBAN GROWTH IN DEVELOPING AREAS

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A. INTRODUCTION

The social and environmental significance of future urban growth still receives insufficient attention. All urban growth that has occurred since the founding of the first towns in Mesopotamia can be expected to double in the next 40 to 50 years. Practically, all of this growth will take place in countries that concentrate most of the world's poverty. These are also countries that are striving to compete in the globalized economy by emulating the economic processes of industrialised nations, with worrying social and environmental consequences. Africa and Asia alone will experience four-fifths of all urban growth in the world between 2000 and 2030; as a result, their combined urban population will double from 1.7 to 3.4 billion in the interim (United Nations, 2006a).

The social and environmental contours of future urban growth will be critical in the future of civilization. The ongoing urban transition provides important opportunities for reducing poverty and enhancing sustainability. Within this context, one specific issue that will have an important impact on sustainability, and that is very much in need of explicit orientation, is the urban use of territorial space. This paper, after briefly summarising the historical context within which the second-half urbanization is taking place, will focus on two sets of aspects that affect the sustainable use of urban space: the importance of sustainability in meeting the land and housing needs of the poor; and the process of converting "rural" land to "urban" uses. A concluding section will discuss some of the policy implications of these different facets of the sustainable use of urban space.

B. TELESOPING TIME AND THE CHALLENGES FOR SUSTAINABILITY

Historical time is being compressed in several dimensions, with enormous consequences for development and sustainability in developing countries. Social processes that took centuries to evolve in the now industrialised countries are not only being condensed into a few decades in developing countries, but are interacting among themselves in novel ways. Moreover, the gradual socio-economic changes that underlay or trigger those processes in developed countries are being bypassed in developing regions through technological innovations and other factors.

Several contrasting approaches have been developed by economists to describe the environmental transitions undergone by cities. The Environmental Kuznets Curve popularized by the World Bank (1992) and by Lomborg (2001), among others, suggested that environmental problems first got worse, and then improved as incomes rose. Major urban environmental problems, in this framework, would be best resolved by further industrialisation and economic growth, according to the win-win argument famously emphasised by the World Bank (1992).

The urban environmental transition theory (McGranahan and others, 2001) questioned this optimistic view and indicated that distinct environmental challenges arise at different stages of development, and that some of these challenges do not follow the Kuznets curve. It suggested that, as cities become wealthier, their environmental impacts shift in nature from localized and immediate health issues to globalised and delayed threats to ecosystems. Marcotullio (2005) built on this model and introduced the notion of "time-space telescoping" in order to help distinguish differences in urban environmental conditions and their transitional phases between current developed and developing cities. Over time, the urban environmental priorities of developed countries have moved from brown issues

(waste disposal and water quality) to gray issues (air and chemical pollutants) and on to green issues (sustainability). However, under the influence of globalization, many developing countries are experiencing this whole set of environmental issues simultaneously (McGranahan and others, 2001; Marcotullio, 2005; Solecki and others, 2005, p. 4).

In the population field, the best-known example of a major social transformation being telescoped in time is that of the so-called “demographic transition,” whereby people live longer and families become smaller as countries move from high to low fertility and mortality rates. The time that this process took was measured by centuries for developed countries, but decades for many developing countries. The case of Iran, which recently experienced a decline of 64 per cent in its total fertility rate in little more than a decade (Vahidnia, 2007) is an extreme but meaningful illustration. Yet, while some developing countries now worry about decreasing population growth, demographic inertia ensures that Asia and Africa will end up with population dimensions that are unimaginable for developed regions.

Less well known, but perhaps even more significant, is the urban transition, where countries move from being primarily rural and agricultural to primarily urban. Again, this transition is being achieved in developing countries over a much shorter period of time, despite involving much greater population volumes than was the case in the industrialized countries. Many Latin American countries accomplished this transition in a few decades, even while experiencing their fastest population growth ever.

It is critical that these three processes—environmental change, population growth and urbanization – are being compressed in developing countries within a historical context that is being simultaneously and differentially moulded by the forces of globalization and decentralization. The simultaneity of these historical changes constitutes what could be characterized as the foremost sustainability nexus of the 21st century.

Within the current globalised development scenario, many rapidly growing poor and developing countries are trying desperately to move out of poverty and, ultimately, to imitate the production and consumption patterns of the industrialized world, while also undergoing rapid urbanization. The expansion of private automobile use in some countries, for instance, is also telescoping, into a few years, the absolute rise in car use that took almost a century in developed countries. More generally, given their much larger population sizes, even the modest achievement of developing countries’ economic goals, under today’s development/environment tensions, could have unforeseen and possibly disastrous consequences.

At the same time, dramatic increases in municipal authority, derived from political and fiscal decentralization, have had two simultaneous effects. First, they helped to greatly reduce the influence of central governments in deciding where and how economic and demographic growth should occur. Second, in combination with globalization, decentralization has provided cities, particularly smaller cities, with exciting new opportunities to manage their own economic destiny. It is not entirely clear how this will affect the trajectory of environmental responsibility, but it is certainly pertinent that smaller cities still constitute more than half of the world’s urban population (UNFPA, 2007).

Environmentalists have generally taken a dim view of urbanization and city growth. At its inception, the modern environmental movement focused its attention on the preservation of nature and, consequently, on rural areas. Thus, it was logical that cities be viewed primarily as the locus of the critical environmental problems generated by the production and consumption patterns of modern civilisation. Although this link between cities and their ecological footprint has undoubtedly been magnified over time, it is increasingly obvious that this is not because cities concentrate population, but because they are

the sites in which “modern civilisation” is evolving—for good and for bad—and because they concentrate mostly affluent consumers.

More importantly, recent years have witnessed a turnaround in environmental thinking, based on the recognition of the potential advantages that cities possess in terms of addressing critical environmental issues, as well as in reducing population growth in developing countries—in addition to their increasingly obvious advantages in promoting economic development. More and more, cities are seen as a potential solution, rather than as a problem, IF a more proactive stance is taken toward urban growth (UNFPA, 2007). As stated by the World Bank while announcing a new pro-urban strategy: “Urban development can have both positive and negative implications for the environment, just as for social welfare and the economy. The balance depends on how it is managed” (World Bank, 2000, p. 39).

Cities can indeed be considered as the site in which the main economic, demographic, social and environmental issues of the future will play out. The way these different dimensions are interacting in today’s cities has, deservedly, been receiving increased attention.¹ However, what has not received nearly as much attention is the magnitude of *future* urban growth and its probable ecological implications. World attention is focused primarily on ongoing processes in existing towns and cities. But these represent only the better known half of the equation in the trajectory of urban sustainability. Indeed, dealing with current issues may be relatively simple, compared to the challenges still to come in the context of globalized development expectations and consumption aspirations, given the dimensions and characteristics of upcoming urban growth.

Current projections would indicate that all the urban growth that occurred in the history of mankind until the beginning of the 21st century will double in some 40 to 50 years. The environmental consequences of this increase are critical since most of this expected growth will occur in the world’s poorest countries. For instance, 83 per cent of urban growth between 2000 and 2030 is expected to occur in Africa and Asia alone. Current approaches and policies often overlook the inherent differences of varying development trajectories for urban environmental management. For instance, discussions of the linkages between urbanization and climate change are wont to lump cities into a single package when discussing mitigation and adaptation challenges, overlooking the enormous implications of massive urban growth in the context of poverty.

This paper focuses on one of the critical environmental problems linked to population growth in urban areas of the developing world—the sustainable use of urban space. The main intention is to derive a better understanding of the significance of different urban growth patterns for sustainability, and, on this basis, to examine policy options for countries undergoing massive urban growth. This leads us to focus on two main questions: the environmental implications of dealing effectively or ineffectively with the land and housing needs of the poor, and the magnitude and significance of “rural” land conversion to urban use. This second issue brings several interrelated topics into focus: the size of the urban blot; the location of urban growth by ecosystem; the relative importance of urban sprawl versus other urban forms; and the relative significance of transportation modes for longer-term sustainability. The concluding section will examine policy options for rapidly urbanizing countries in terms of what can be done to reduce the negative consequences and maximize the potentialities of upcoming urban growth, especially in smaller cities.

C. THE IMPORTANCE OF MEETING THE LAND AND HOUSING NEEDS OF THE URBAN POOR

The largest social category in the towns and cities of developing countries is often overlooked in the planning of urban space. Although poverty rates are systematically lower in urban areas, it is of some significance that the *number* of poor people is now growing faster in towns and cities. Poor people represent anywhere from one-quarter to three-quarters of the urban population in those locations,

depending on the region and on the way poverty levels are calculated. According to UN Habitat's *State of the World's Cities 2006-2007*, developing world slums contained 933,000 inhabitants (UN Habitat, 2006, p. 16). This is equivalent to 41 per cent of the estimated urban population of less developed countries in 2005 (United Nations, 2006a). The proportion of slum dwellers is largest in some of the sub-regions that are expected to experience substantial absolute urban growth in coming decades. Thus, 72 per cent of urban populations in sub-Saharan Africa and 57 per cent of those in Southern Asia are slum dwellers.²

Similarly, *urban growth* in developing countries tends to be made up of mostly poor people (UNFPA, 2007). The new urbanites—those who will double the urban population of Asia and Africa in the 2000-2030 period—will be made up, to an even larger extent, of poor people. This is because, on the one hand, rural-urban migrants, upon arrival, tend to have somewhat lower average socio-economic levels than the native urban population; on the other, since poor people have higher rates of natural increase; their relative contribution to urban growth tends to be higher than their present share of the urban population.

Yet, despite their overrepresentation in existing urban areas and their even greater contribution to future growth, the presence of poor people seems to go largely unacknowledged in the formulation of city plans in developing countries. Seldom are the needs of these people contemplated realistically and explicitly. On the contrary, to the extent that they are planned, cities are largely configured and redefined basically in accordance with the political influences of real estate capital, with large-scale infrastructure designed to fit the needs of economic activity, and in keeping with the demands and preferences of middle and upper-income groups.

Thus, the real and crucial contributions of the poor to the economic life of the city tend to be overlooked and they tend to enter the picture only as a source of problems. In particular, their habitats are seen as eyesores and hindrances that policymakers wish would somehow disappear. Since governments will generally not service areas where land rights are unclear, informal settlements are rarely provided, especially during their formative years, with water, sanitation, transport, electricity or basic social services. Frequently, the pattern of occupation in informal settlements is haphazard and asymmetrical, making it difficult to provide vehicular transportation, or other types of services.

It will be argued here that such difficulties not only exacerbate the miserable conditions of the poor in urban areas, but ultimately have an impact on the quality of life and sustainability of the entire city. Nowhere is the neglect of the poor more blatant, and its broader repercussions more detrimental, than in the area of housing. Disregard for the needs of the poor for land and housing makes them fend for themselves as best they can; this generally means that their quest for housing, infrastructure and services is not only a constant struggle, but one that affects the entire range of urban dwellers in various ways.

As has been pointed out repeatedly by analysts, the problems of most informal settlements are already determined by the way they come to life (Serra, 2003). Lack of access to land, for example, predetermines difficulties of access to shelter. This unnecessarily accentuates human misery and is the starting point for a vicious circle of poverty. The poor live in environments that typically concentrate hazards and lack minimal access to clean water for drinking, cooking, washing and bathing, as well as to serviceable toilets and garbage collection. These conditions increase the spread of disease-causing germs, frequently leading to chronic digestive tract illnesses. Crowded environments help promote such contact-related diseases as measles and tuberculosis, in addition to diarrhoea. Under-nutrition due to high prices of nutritious food leads to severe child malnutrition (Stephens and Stair, 2007, p. 137). In short, a large segment of the urban population is condemned to a stultifying and unremitting wretchedness that stems, to a great extent, from the lack of minimally decent housing.

Disregard for the land and housing needs of the poor also contributes significantly to environmental degradation because it affects both ecosystem services as well as the city's ability to responsibly and effectively plan for sustainable growth. Having little choice but to invade stigmatised or off-limits terrains, the poor sometimes occupy ecologically-fragile areas and watersheds, thereby endangering the city's water supply and other ecosystem services. Deforestation to clear spaces for housing also results in flooding. Meanwhile, the occupation of urban floodplains and wetlands not only endangers the lives and possessions of the poor, it also increases the probability of flood damages to other parts of the city. By the same token, the invasion of steep slopes and the removal of tree cover increase the probability of landslides that will not only bury the residents themselves but also spill over into roads, tunnels, streets and houses at lower levels.

The lack of access to water, sewage or solid waste management systems in informal settlements pollutes rivers and ends up affecting the appearance, air quality and health of the entire city. The health costs of dealing with these impacts are very large: "A million or more infants still die each year from diseases related to inadequate provision of water and sanitation, and hundreds of millions are debilitated by illness, pain and discomfort... It is still common for one child in ten to die before their fifth birthday in urban areas in low-income nations, with much higher mortality rates among low-income urban dwellers" (Satterthwaite and McGranahan, 2007, p. 27). In addition to direct impacts on the health of poor people, the number of hours lost due to illness has severe consequences, both for the overall productivity of the labour force and for household income.

The sprawling haphazard settlement patterns that typify the invasion of urban lands by poor people also make it much more difficult to put basic infrastructure into place, including roads and pathways that would facilitate the free movement of residents. The sprinkling of such settlements throughout the city also creates hurdles for the design of effective mass transportation and increases the costs of implementing it. Continually adjusted improvisations that ineffectually attempt to accommodate the increasing flow of people and vehicles (and sometimes animals) through narrow winding streets that bypass these sprawling settlements, not only consume enormous resources, but also contribute to energy waste and pollution.

Perhaps even more telling in today's context of globalized economic competition is the fact that the lack of attention to the land and housing needs of the poor is ultimately bad for business; in a classic vicious circle, it helps to trigger a series of perverse effects that ultimately affect the very ability of a city to be competitive and thus to pursue economic and social development. For instance, it disorganizes the functioning of land markets, pushes up land prices, and increases the difficulties of providing infrastructure and services (Smolka and Larangeira, 2008). In turn, this affects the ability of the city to attract investments, to create jobs and to generate a better financial base for implementing improvements in the city.

In the context of globalization cum decentralization, cities have to generate a favourable business climate that stimulates private and public sector investment in order to generate jobs and improve the tax base. Good governance, level of corruption, quality of infrastructure, good transport and communications, level of access to services and urban amenities, expenditures on health and education, infant mortality rates, an institutional milieu that reflects respect for individual rights, the absence of violence, the effort to meet international standards for waste disposal, air quality and green space per capita are all valuable assets in attracting investments (Campbell 2003; World Bank, 2006). Lack of attention to the housing needs of the poor tends to have negative effects on each of these factors.

In short, attending to the land and housing needs of the urban poor not only has a direct impact on the reduction of poverty but also affects the city's viability and sustainability. Having secure access to a home that can gradually be improved over time is the starting point for poor urban people to gain access

to what a city has to offer. Moreover, ensuring that poor people have the possibility of attaining decent living conditions can also be critical in improving the quality of life of the entire city. This affects both the city's environmental conditions and its economic dynamism. Reducing urban poverty and environmental degradation makes the city more habitable for the entire population. In this regard, attending to the housing needs of the poor helps to promote the conditions for urban environmental well-being—an effective win-win situation.

Overall, the prospects for cities and their inhabitants in developing areas would be greatly improved if national and local governments took proactive steps to deal with the land and housing needs of the growing contingents of the urban poor. Admittedly, adopting such initiatives is never easy: it goes against the grain of both the swell of anti-urban growth and anti-urbanization preferences of policymakers in developing countries,³ as well as the vested interests of strong local power structures that often congregate politicians, administrators, real estate agents and other speculators who benefit from informal urban land markets. Whatever the nature of these difficulties, sustainability will require that, at a minimum, the land and housing needs of the poor be given priority attention in rapidly growing urban areas.

D. THE EXPANSION OF URBAN SPACE—JUST HOW BIG AND HOW BAD IS IT?

One of the most common environmental criticisms directed at cities is that they occupy and destroy an enormous area of precious land. Such broad condemnations evidently merit qualification. To this end, we will examine here several aspects of the size, location, density, environmental characteristics and social organization of the total land area under urban use, with emphasis on their significance for future urban growth.

1. The size of the urban blot

Recent years have given us much improved estimates on the dimensions of the Earth's land area that is covered by urban localities. These new sets of global databases on urban population and extent combine census data, satellite imagery and different methods of analysis in an integrated geospatial framework. Two of the best known recent studies based on such technologies can, for purposes of this paper, be taken as the upper and lower limits of the current size of the area currently occupied by urban localities.

The Global Rural Urban Mapping Project (GRUMP) is a widely-acclaimed multi-institutional and multi-year effort to construct an improved population and consistent database of urban areas (CIESIN, 2007). Its best estimate is that urban localities occupied, in the year 2000, a land area of 3,673,155 km². This would correspond to about 2.8 per cent of the Earth's total land area, equivalent to less than half of Australia's total land area. These figures, used as basis for the Millennium Assessment, have been debated at length by specialists, and it is fair to state that they constitute the upper limit of current estimates.

On the other hand, the low estimate can be taken from a recent study commissioned by the World Bank (Angel and others, 2005). This focused only on cities having more than 100,000 persons and, within them, *only on their built-up areas* (excluding green areas and other interstitial spaces). Using a sample of 120 cities worldwide, Angel and others estimated that cities of 100,000 or more inhabitants contained 2.3 billion of the estimated 2.84 billion urban inhabitants in the year 2000. These urban inhabitants used up a total built-up space of 400,000 km² worldwide, equivalent to 0.3 per cent of the Earth's land area.

Assuming that the total urban population living in urban localities having less than 100,000 inhabitants (540 million) had an average density of 6,000 persons per square kilometer,⁴ they would

occupy another 90,000 km². Under such assumptions, the total land area in urban localities would amount to 490,000 km² (400,000 + 90,000), or an area slightly smaller than Spain and less than half of one per cent of the Earth's total land area.

In short, in 2000, approximately half of the Earth's population occupied an area equivalent to between 0.4 and 2.8 per cent of the Earth's surface, depending on how it is measured. For present purposes, the exact figure is not an issue here since any number within this range does not, in itself, represent a critical threat to the Earth's sustainability. The magnitude of the land area currently occupied for urban purposes, *per se*, does not seem to be a problem at the global level. Moreover, these numbers have to be put into perspective. For instance, the annual acreage given over to urban use is much smaller than the natural lands that are lost every year to agricultural activities, forestry and grazing. It is also much smaller than the amount of prime farmland that is lost annually to erosion or salinization: the issue may thus be more the *type* of land that is being lost than the absolute scale of the loss (World Resources Institute 1997, p. 32).

Although human settlements have so far taken up a relatively small fraction of the Earth's surface area, their specific spatial location can still exert significant environmental and socio-economic consequences. Another source of concern relates to how this occupation of the Earth's land surface by towns and cities will evolve with urban population doubling. Depending on their future spatial growth patterns, urban localities could expand drastically in coming years, both in dimension and in their occupation of inappropriate areas in coming years. Such observations put our spotlight on two related issues: the decreasing density of cities and the significance of urban growth in different types of ecosystems.

2. Decreasing densities and expanding perimeters

The aforementioned World Bank study (Angel and others, 2005) provides concrete evidence that urban land areas are growing faster than ever, not only because of their increase in absolute numbers of people, but also because their average density (that is, the number of inhabitants per square kilometre) is being progressively reduced. This study, based on the actual built-up areas of towns and cities, rather than on administratively-defined areas, observes that urban density has been declining for the past 200 years, but finds that the reduction has been particularly rapid in recent years (Angel, 2006). This tendency towards declining density, combined with unprecedented absolute increases in the urban population, could greatly expand the land area of cities in the future.

As indicated earlier, according to this study, the total built-up area of cities having at least 100,000 people, presently occupies a total of about 400,000 km² –half of which are in the developing world (Angel and others, 2005, pp. 1-2). Cities in developing countries have many more people, but they occupy less space per inhabitant than in developed countries. In both developing and industrialized countries, average densities of cities have been declining quickly: at an annual rate of 1.7 per cent over the last decade in developing countries, and of 2.2 per cent in industrialized countries (Angel and others, 2005, pp. 1-2).

Should the recent rate of decreasing density persist, the land occupied by cities having 100,000 people or more will increase by a factor of 2.75 by 2030. If current patterns continue, every new resident in developing countries will convert, on average, some 160 square meters of non-urban to urban land during this period. The combination of absolute increases in urban population with this rate of density reduction is expected to *triple* the built-up land area of cities of 100,000 or more inhabitants in developing countries to 600,000 km² during the first three decades of this century (Angel and others, 2005, pp. 1-2). It should be noted that these figures reflect overall averages: both decreasing density and size of urban areas will obviously change more rapidly in those countries and cities that are undergoing more intense

growth. For instance, the metropolitan area of Shanghai, China is expected to grow by 150 per cent, from 410km² to 1100km² in less than a decade (Martin, 2005, p. 127).

Cities in developed countries expand at an even faster rate per resident. Thus, despite their smaller population size and lower rates of population growth, cities in the industrialized world would increase their land area by 2.5 times by 2030, if they continued at the current pace. They would occupy some 500,000 km² and every new urbanite will convert, on average, some 500 square meters of non-urban to urban land (Angel and others, 2005, pp. 1-2).⁵

Overall, should recent trends be perpetuated, the built up land area of cities in the world would grow from 400,000 to 1,100,000 km² in only a 30-year period. But this is likely to be an understatement, for two reasons: first, it can be speculated that recent trends in decreasing density will not only continue but will, in fact, increase with globalization and with its impacts on lifestyles, aspirations and production processes, as well as with the rapid improvement and dissemination of transportation technology, especially automobile transport; and second, all of the above estimates, it will be remembered, relate only to the built-up areas of cities having more than 100,000 inhabitants. These contain, according to Angel and others (2005) some 80 per cent of the world's urban population. The remaining 20 per cent will be located in smaller urban centres, where rates of growth tend to be higher.

In short, the land areas appropriated by towns and cities can be expected to increase at an ever faster rate. No matter where one stands on the "urban sprawl" versus "compact city" controversy (discussed below), one cannot avoid observing that cities are, in fact, sprawling. However, in developing countries – which again are the main area of interest of this paper – urban sprawl today is much more than just suburban residential development caused by changing values and lifestyles. Peri-urbanization (or the non-contiguous and patchwork form of urban expansion and leapfrog development, related to land speculation, to changing production modalities and to the spread of automobile transportation) may be the dominant form of urban expansion today.

Land speculation raises the price of land to a level that is considered too high for those needing land for actual use. Thus, when many speculators are sitting on land and waiting for higher prices, it forces those who actually need land for residential or productive activity to skip around them and to obtain land farther and farther away from the city (Tacoli and others, 2008). The prospects of rapid urban growth per se tend to favour more speculation. This can be adduced as a major cause of urban sprawl and peri-urban growth.

Moreover, the form and site of urban economic activity have been altered by advances in telecommunications, transportation and production technologies. The benefits of agglomeration can be eroded by information technologies and by transportation networks that also foster economies of scale in production and distribution networks and favour large facilities that consume large tracts of land. All of these factors can be expected to help deconcentrate firms away from the main city (Irwin, 2004).

The spread of these advances through globalization have favoured de-concentration and decentralization of production at greater distances from the centre of cities throughout the world. The end result is that, the world over, the urban blot is growing considerably faster than the number of people. Where and how this new land is incorporated into the urban makeup could have a huge impact on the social and environmental well-being of future populations, as discussed in the next section. Unfortunately, very little attention has been paid to this problem in developing countries where most future growth will occur (Angel and others, 2005).

3. Location of urban areas by ecosystem

The basic environmental concern with the conversion of rural land to urban use is that urban growth often involves the appropriation of some of the best agricultural land in the country, and/or that it invades ecologically-fragile areas. This contention would seem validated, at least in preliminary form, by recent research that classifies urban localities according to the ecosystem in which they are situated.⁶ As shown below, both ecologically-fragile coastal areas and regions under cultivation are likely to have a higher proportion of urban settlements than other systems.

Throughout history, people have favoured city-building in coastal areas to take advantage of a ready food supply, easy access to transportation, and better defence opportunities. Consequently, as shown in table 1, based on work done for the Millennium Assessment (McGranahan and others, 2005), coastal ecosystems contain a much larger proportion of all urban dwellers (14.4 per cent) and large city population (23.9 per cent) than of the world's total land area (3.2 per cent). In all continents except North America, coastal zones have the highest share of urban population than any other ecosystem. The proportion of coastal land area that is occupied globally by urban localities (10.2 per cent) is almost four times larger than in the average for all ecosystems. Moreover, the coastal system has a greater proportion of its land area occupied by urban localities, a greater proportion of its inhabitants living in urban areas and a much greater urban population density than any other type of ecosystem.

What implications do such findings have for sustainability? In general, the Millennium Assessment declined to explore the differential impacts of cities across the systems they inhabit, arguing that such consequences depend considerably on local conditions (McGranahan and others, 2005, p. 802). Yet, as has been well documented, coastal areas are critical for long-term sustainability. The occupation and development of these areas can cause severe environmental damage, which in turn ends up affecting the quality of life of urban inhabitants. Urban settlements in coastal areas cause the destruction of natural habitats and consequent biodiversity loss, while also altering local and regional hydrology. Invasion of mangroves, coral reefs, seagrass beds and sand dunes destabilizes the coastline, leading to erosion or siltation, damaging infrastructure and increasing the vulnerability of local and regional populations to natural disasters while reducing resiliency to climate change and rising sea levels. Fish stocks can also be lost when important breeding and nursery areas are disturbed.

Cultivated agricultural systems also have higher than average segments of their land areas taken over by urban localities. Since many towns and cities were originally located at the heart of some of the more productive land areas in their respective countries, the outward spread of their urban boundaries inevitably tends to destroy prime farmland. At the global level, ecosystems classified as "cultivated" in the Millennium Assessment also have almost twice the proportion of all urban dwellers as of land area (37.2 per cent and 19.3 per cent, respectively) along with 34.2 per cent of all of the planet's large city population. The proportion of its land area given over to urban sites is 2.4 times that of the average for all ecosystems.

Inland water zones have a somewhat higher proportion of their population in large urban centres while other ecosystems—such as mountain, dry land and forest ecosystems—tend to have a much smaller proportion of their land area in cities and to harbour smaller cities.

Even more pertinent for long-term sustainability is how different types of systems are likely to be affected by future urban growth. Since Africa and Asia are expected to account for some 83 per cent of the growth of the world's urban population over a 30 year period ending 2030, more attention needs to be focused on trends in those regions. As shown in table 2, these two regions, despite having the lowest proportions of their total populations living in urban areas (38.3 per cent for Africa and 39.8 per cent for

Asia, in 2005, according to United Nations, 2006a), already have the highest urban density in all system types.

Taken by itself, this information on high urban density would bode well for sustainability, since it is an indication that sprawl is much less prevalent in those two regions. In general terms, higher density helps to minimize human invasion of surrounding rural land. On the other hand, it may be of some concern that these two continents have, by far, the highest proportion of their urban populations living in coastal areas: 72 per cent for Africa and 56 per cent for Asia (McGranahan and others, 2005, p. 801). The urban density of Africa and Asia in coastal systems is three to four times higher than in industrialized regions. Inland water systems also have particularly high urban densities in Africa and Asia.

Table 3 provides additional information on the distribution of urban population by ecosystem in Asia and Africa. Essentially, it reiterates the significance of coastal towns and cities in those two regions. Coastal systems in both Africa and Asia have a considerably larger proportion of their total area in urban land, and tend to have larger cities than other systems, in addition to having greater total and urban density. Cultivated and inland water systems are also prominent on these various indicators in both regions. The significance of these findings is less clear, since, as pointed out by the Millennium Assessment, urban distribution also reflects a region's basic geography and other characteristics; thus, dry land or cultivated systems only have 20 per cent of their population in urban areas, but contain more than half of Africa's urban population for the simple reason that such systems predominate in the region (McGranahan and others, 2005, p. 802).

Without minimizing the importance of past and current trends, the more important question is: what will happen to the different ecosystems with the rapid doubling of the urban populations in these two regions? What can we predict from past and current patterns for future distribution? This is still a matter for speculation. On the one hand, although past patterns do not necessarily indicate that future growth will be concentrated in the same systems as in the past, historical linkages tend to be significant. Accumulated advantages of cities, ranging from urban amenities to agglomeration economies, are generally appreciated by investors in a market economy. Moreover, the advantages of large urban areas over smaller towns and cities in total factor productivity have been well demonstrated in the literature (World Bank, 2000, p. 37). Potential migrants are also attracted to existing larger centres since these tend to be more dynamic in creating jobs.

TABLE 1 – DISTRIBUTION OF URBAN POPULATION IN SELECTED ECOSYSTEMS

<i>Type of Ecosystem</i>	<i>Per cent of Urban Dwellers in Ecosystem</i>	<i>Per cent of Total Land Area in Ecosystem</i>	<i>Per cent of Large City Population (Cities of 5+ million people)</i>	<i>Urban land as per cent of ecosystem's land area</i>	<i>Per cent of ecosystem's population in urban areas</i>	<i>Urban Population Density in Ecosystem</i>
Coastal	14.4	3.2	23.9	10.2	64.9	1 119
Cultivated	37.2	19.3	34.2	6.8	45.3	793
Dry land	18.7	29.2	12.7	2.1	44.9	749
Forest	7.8	20.5	6.3	2.0	35.6	478
Inland Water	15.1	14.3	18.9	3.2	51.8	826
Mountain	6.8	15.6	4.0	1.7	30.3	636
Overall	100	100	100	2.8	46.7	770

Source: Based on McGranahan and others, 2005, tables 27.4, 27.5 and 27.6.

NOTE – The ecosystems are not mutually exclusive. Figures in columns 2, 3 and 4 thus contain duplications of population and land area. Island systems are excluded.

TABLE 2 – URBAN POPULATION DENSITY IN SELECTED ECOSYSTEMS, BY CONTINENT

<i>Ecosystem</i>	<i>Africa</i>	<i>Asia</i>	<i>Latin America</i>	<i>Oceania</i>	<i>Europe</i>	<i>North America</i>	<i>World</i>
Coastal	2 123	1 934	789	610	640	497	1 119
Cultivated	1 279	1 352	548	300	630	258	793
Dry land	1 200	1 034	541	159	522	265	749
Forest	997	956	685	300	387	206	478
Inland Water	1 647	1 536	655	451	604	302	826
Mountain	810	879	746	191	387	154	636
Overall	1 278	1 272	656	427	588	289	770

Source: Based on McGranahan and others, 2005, table 27.6.

NOTE – The ecosystems are not mutually exclusive. Island systems are excluded.

Conversely, it can be contended that globalization is already shifting trade and production away from many traditional centres, favouring localities that can demonstrate market advantage. Although decentralization has advanced at variable speeds in different parts of the world, cities are now linked more directly to international markets. This has reduced the traditional market advantages of some cities and promoted others. Such changes may, in turn, induce large shifts in population distribution, including away from traditional centres (World Bank, 2000, pp. 1-2 and 34-35).

In brief, it may be difficult to predict whether inertia, or the new forces of gravitation caused by the combination of decentralization and globalization, will have greater influence on the probable evolution of urban growth patterns in those countries that have yet to undergo a significant urban transition. In itself, this apparent ambiguity might seem to allow some leeway for influencing these processes into more sustainable directions.

TABLE 3 – DISTRIBUTION OF URBAN POPULATION IN SELECTED ECOSYSTEMS, AFRICA AND ASIA, 2000

<i>Ecosystem</i>	<i>Urban land as percentage of ecosystem's land area</i>		<i>Percentage of ecosystem's population in large urban areas*</i>		<i>Urban population density in ecosystem</i>		<i>Average population density in ecosystem</i>	
	<i>Africa</i>	<i>Asia</i>	<i>Africa</i>	<i>Asia</i>	<i>Africa</i>	<i>Asia</i>	<i>Africa</i>	<i>Asia</i>
Coastal	5.4	13.0	56.1	69.6	2 123	1 934	160	451
Cultivated	1.8	6.9	49.8	47.5	1 279	1 352	56	255
Dry land	0.6	3.0	50.3	41.6	1 200	1 034	18	82
Forest	0.5	2.6	25.9	39.9	997	956	23	105
Inland Water	1.2	5.0	54.6	56.7	1 647	1 536	37	185
Mountain	1.1	1.6	19.8	34.1	810	879	42	60
Overall	0.8	3.5	45.9	50.6	1 278	1 272	27	120

Source: Based on McGranahan and others, 2005, table 27.6.

NOTE – The ecosystems are not mutually exclusive. Island systems are excluded.

* Cities of 1 million or more

4. The structure and form of urban expansion: will it matter? ⁷

What implications will current trends in the form of urban expansion have for sustainability in developing countries? Given that the world's urban population is expected to double within a relatively short time, and that most of this growth will be concentrated in Africa and Asia, where environmental concerns have generally not taken precedence, it would seem advisable to try to orient this spatial growth in ways that not only avoid the invasion and destruction of prized ecological assets but that also reduce other environmental costs.

How could this be done and in what ways? If one was to suggest models of sustainability to orient the doubling of these regions' urban population, where would one look? To this day, the most voluble discussions concerning patterns and forms of city growth, and their relation to sustainability, undoubtedly originate from the debate between critics of urban sprawl and their opponents, the critics of the compact city. This debate is a veritable minefield, booby-trapped with definitional problems, measurement issues, value judgments, ideological perceptions and culture-bound assumptions. Nevertheless, it cannot be ignored simply in any discussion of urban sustainability, particularly when one considers the potential impacts of different patterns of urban expansion in those regions where most urban growth is still to come.

The prototypical urban sprawl that has become the object of many environmentalists' denunciations began with a model of suburban growth spawned in the United States of America in the late nineteenth and early twentieth century. In its initial stages, suburbanization represented a significant improvement for many central city dwellers, who moved from congested, polluted and unhealthy habitats to pleasant, country-style, clean-air environments. This model expanded rapidly and blossomed into a critical part of the ethos associated with "The American Dream" (Hogan and Ojima, 2008). After World War II, several factors helped propel the rapid proliferation of this model across American cities, including: the post-war economic boom; the ease of access to automobile ownership and to inexpensive fuels; the availability of cheap open land on urban peripheries; and the aesthetic and cultural attraction of single-family dwellings.

Decentralization, however, was not without its problems: some of these had already been identified in the 1930s. By the 1960s, however, "urban sprawl" became the pejorative term used by many to characterize the negative environmental, social and economic implications of suburbanization. However, by that time, suburban growth had been bolstered both by policies that encouraged urban dispersal and by the expansion of decentralized commercial and service systems catering to suburbanites. Environmental awareness, and the Bruntland Report's emphasis on sustainability, greatly expanded the disparagement of "urban sprawl" in the 1980s, helping to give greater credit to the notion that alternative models could be the ideal road to urban sustainability (Arbury, n.d.).

Growing concern with low-density automobile-dependent urban sprawl, and with the environmental problems it generated, thus spawned a renewed interest in the compact city model. This focused basically on intensifying the use of urban space and on increasing the role of public transportation. Compact cities would be more sustainable because they would minimize commuting, reduce energy use, air pollution, water consumption, loss of green space and vegetation, while also avoiding the squandering of biomass on paved streets, driveways and parking lots.

Quality urban design was seen as the key to sustainability. The compact city approach combined environmental objectives with concerns about the future quality of life in urban areas and with equity. In its application, the concept of the compact city borrowed from stylized images of the physical, economic, and social conditions in "traditional" patterns of human settlement prior to the industrial age: the

archetype from which they all stem is the ancient village—physically compact, economically localized, and socially self-contained (Brindley, 2003).

More recent offshoots of the compact city approach and its emphasis on urban design as the key to sustainability have materialized through the models of “New Urbanism” (United States), “Smart Growth” (United States), “Urban Renaissance” (United Kingdom) and “*Machizukuri*” (Japan), and through various “healthy community” movements. Although each has specific ideas about how cities ought to develop, all of these schools have their roots in the same normative ideals that are founded on the notion that urban sprawl damages the environment, sacrifices natural areas and farmland for development, wastes energy and other resources, creates traffic congestion, and in other ways lowers the quality of life (Holcombe, 2004).

The general formula to counteract sprawl in these models includes at least some of the following: compact form, high density, mixed use, intensification of public transportation, greater pedestrian and bicycle transit, utilisation of interstitial spaces, protection of natural ecosystems, revitalization of downtown areas, reduction of the amount of land affected by roads and parking lots, increased social and economic interactions and more efficient utility and infrastructure provision. During the early 1990s, various compact city policies were enthusiastically implemented throughout Europe, particularly in the United Kingdom (Arbury, n.d.).

The actual implementation of the compact city approach has been quite heterogeneous and, in the process, the model has acquired operational fuzziness. In retrospect, it has become clearer that the potential of the compact city to meet its objectives is dependent not only on the form it actually takes as a result of drawing-board designing efforts, but also on political structures, societal values, and the general preparedness of the society. There seems to be some consensus that the cities which best support the promotion of equity are those with a large proportion of high-density housing and a large quantity of locally-provided services and facilities. In the end, however, the way compactness benefits individual aspects of social equity varies, depending very much on prevailing societal values (Burton, 2003).

Overall, critics of the compact city model question whether intensification can deliver on its promises of a more sustainable urban future and whether it is acceptable to the general public (Arbury, n.d.). Some of the key points made by critics of the compact city include the following:

- All told, the results of compact city innovations have not lived up to expectations. Their claimed benefits are more ideal than real;
- Neither sustainability nor equity can be achieved through formal designs, especially those coming from the master plans of drawing board planners;
- Compact-city strategies have lost touch with a spatial reality: polycentric urban regions and not compact cities have actually become the dominant form of urbanization in Northwest Europe;
- Compact city policies are anti-democratic, certainly anti-urban, infringe on personal freedom, frustrate consumer choice, and promote homogeneity;
- Compact cities drive up the price of land and housing due to higher design, construction and common-area infrastructure costs;
- The desire to maximize density can lead to layouts that lack privacy and that present an unusual appearance that is disliked by residents;

- The models go against the grain of market forces;
- Compactness has a limited and tenuous relationship with social equity; and
- Compact cities fail to deliver what people really want: a single family dwelling on a large lot, with good automobile access to facilities.

As is evident from the foregoing brief and selective summary, the sprawl versus compact debate is politically loaded and unlikely to be resolved via academic debate, particularly since basic methodological problems still haunt the field. What constitutes “urban sprawl” is the object of infinite discussion; not only are ideological issues rampant but the very notion of what constitutes an “urban” area, or how “sprawl” is to be measured, are still being debated. The definition of a “compact city,” though somewhat less diversified, is also subject to different interpretations.

Nevertheless, criticism of the compact city approach, though at times culture-bound and variably ideological is, at least in part, based on correct assessments of the assumptions and shortcomings of this model. At the same time, most critics of the compact city models evidently stop short of defending sprawl per se. The declining density of cities—associated with sprawl, as well as increased commuting and, thus, greater energy use and air pollution, loss of green space, increased water consumption and squandering of biomass—is markedly difficult to defend.

More importantly, in reviewing this debate, it seems that the critics of the compact city approach offer little by way of alternatives—particularly not for rapidly urbanizing developing countries. Neuman (2005), one of the most thorough and articulate critics of the various compact city models, cites and supports the proposals made earlier by Leatherbarrow and Durack for “open, indeterminate planning.” This supposedly confers four advantages: “first, it supports cultural diversity; second, it tolerates and values topographic, social, and economic discontinuities; third, this type of planning invites ongoing citizen participation; and finally, it responds to the state of continuous adaptation, common to all living organisms and systems, including human settlements” (Neuman, 2005, p. 14).

The “advantages” cited in this proposal (cultural diversity, valuation of discontinuities, citizen participation and adaptation) are undisputedly desirable components of any urban planning system. The puzzling query, however, is why would a rather vague “open and indeterminate” planning system be expected to produce such positive results and what environmental criteria and procedures therein will guide city growth?

Overall, the key issue may not be so much the choice between sprawl and compact as the sustainability of a given urban configuration. For instance, Neuman (2005), reviews the case for identifying compact cities with sustainability and concludes that “... conceiving the city in terms of form is neither necessary nor sufficient to achieve the goals ascribed to the compact city (Neuman, 2005, p. 16).” Less convincingly, Neuman (following Kostoff), ultimately places all his chips on the primacy of “process” over form. According to this, sustainability is a process of people adapting to and changing a city over time (Neuman, 2005). It is not entirely clear whether process is understood therein as a dialogue among social groups or as simply letting “market forces” take their course, as recommended by Holcombe (2004).

A longer-term evolutionary (*laissez-faire*) approach is obviously a perfect foil to the “master designer” conception attributed to compact city developments. Moreover, it may be more justifiable to let natural processes (i.e.—the interplay of political and economic forces in the absence of an overall master plan) evolve in older and slow-growing cities of the developed world, wherein citizens have an historical sense of the needs, problems and advantages derived from their city’s structure, form and operation. Even

there, however, if one takes a longer-term evolutionary perspective, the compact city models, despite some undeniable errors in their assumptions, could conceivably be viewed as part of the process that will eventually help promote sustainability by emphasizing the disadvantages of sprawl.

Nevertheless, the discussion has to take a different turn when discussing future urban growth in developing countries. Despite its domination of the literature, most of the sprawl versus compact city debate is highly ethnocentric in its focus: it centres almost exclusively on the urban issues of industrialised countries. There, lifestyles and consumption patterns are marked by easy access to automobiles and even by subsidized fossil fuel prices. Obviously, this discussion loses a lot of its meaning in contexts where a large part of urban growth is made up of poor people who do not have even the remotest chance of access to automobile transportation.

Yet, even in the framework of developed countries, the outcomes of evolutionary processes are not necessarily “good,” or permanently “good.” For instance, sprawl itself is evidently the result of process. In turn, this sprawl may eventually be reduced through “natural” processes, such as increased gasoline prices or physical limitations on expansion. For instance, it is highly revealing that even Los Angeles, the acknowledged “mother of all sprawl cities,” may soon become notorious as the birthplace of the post-suburban city (Cuff, 2007, p. 86). Faced with prospects of expanding population growth and limitations on land, water and commuting viability, “sprawl has hit the wall” in Los Angeles: outward growth has slowed and interior gaps in the city fabric are being plugged as neighbourhoods fill in and grow denser (Cuff, 2007, pp. 86-87).

Leaving the destiny of rapidly growing cities of poor countries to evolutionary processes does not appear to be a promising path, especially in view of the fact that the lifestyles and preferences of the ruling elites are likely to follow the consumer patterns of industrialised societies. Rapidly growing cities in poor developing country may not have the luxury of waiting for such things as sprawl to sort themselves out and to eventually become sustainable. Too much social and environmental damage is likely to take place before that happens. On the other hand, it is true that few technocratic master plans have had much success in effectively harnessing rapid growth in developing country cities. What is the answer?

The solution would appear to lie on two levels. Firstly, planning is increasingly essential, but a different kind is needed: planning that is non-technocratic and reflects basic values that are consensually defined by all participants and not just the viewpoints of architect-planners and engineers (or other less-influential categories such as demographers). It must be founded on special and genuine efforts to incorporate the perspectives and aspirations of the poor majority. Whatever the results of this participatory approach, it must be more open-ended, continually revised on the basis of consensual values so as to reflect changing realities and the challenges of growth. New approaches to “strategic planning,” that incorporate uncertainty and provide for regular and systematic revision, aim to foster a planning process which is participatory, seeks to proceed on the basis of goals and values, but whose concrete interventions are regularly updated.

Secondly, such plans must reflect an environmental, rather than a formal approach to city growth. The outlines of this orientation are suggested by McGranahan– “... Sprawl is almost always a symptom of environmentally negligent development, but the solution is not necessarily to strive for compact settlement. Rather, the response should be to take environmental concerns seriously in planning, taxing, etc. This may well yield more compact settlement, but might also yield other more environmentally sustainable forms. For example, higher gasoline taxes, more investment in public transportation and road pricing could be justified not as a means of achieving compact settlement, but as a way of limiting environmentally damaging transportation. The effects may be compact settlement, but if the result is some multi-nucleated low-transport settlement that doesn't fit the definition of compact, is that necessarily a

problem? Similarly, is it not possible that ecologically-informed development restrictions can create more green spaces and more ecological service production within urban settlements, and contribute to sustainability, but also make the settlement less compact?”⁸

So far, the debate between sprawl and compact has mostly precluded the type of discussion suggested by McGranahan. Moreover, it has largely omitted some really basic issues that do urgently need to be taken into consideration when the prospect of urban doubling in Africa and Asia is under the microscope.

Although it is generally recognized that the American form of suburban development is spreading to many cities throughout the world (Hogan and Ojima, 2008), it is only part of a much larger set of problems plaguing the growing cities of the developing world. Decreasing urban densities today are not primarily the product of residential preferences but, especially in developing countries, they are increasingly linked to a combination of factors that include the mobility of globalized economic activity, heightened speculation in land, lack of administrative controls and an overriding under-valuation of environmental assets.

Suburbanization in the classical North American mode affects only a small segment of the developing world's population. Developing country cities are constituted generally of poor people whose primary aspirations revolve around minimal housing and access to jobs and incomes that will permit them to survive and slowly improve their housing and living standards. The house and car on a big lot that constitute “what people really want,” according to some critics of the compact city, can only be attained by a small minority and represents a mere fantasy for the great majority of the urban population in developing countries. Yet, the tragedy is that the aspirations of the minority tend to dominate city planning and the allocation of resources within the burgeoning cities of developing countries.

The escalating prevalence of automobile use is one clear instance of the inappropriate, inequitable and unsustainable patterns that are dominating urban growth. It is an issue that has already received considerable interest in the literature, but it still deserves greater attention in the context of urban doubling in Asia and Africa. Most of the sprawl versus compact city debate ultimately appears to have limited relevance to these two regions. The possibility that densely populated countries will find room and resources to build freeways *à la* Los Angeles seems remote. Nevertheless, the issue of transportation and the use of the automobile are critical in developing countries, as discussed in the next section.

5. Car transportation, sprawl and equity

From a reading of the above sections, it would seem fairly evident that issues of transportation are at the root of many discussions of urban sprawl and urban density. Automobile use is both a cause and a consequence of sprawl in many countries and innate values pertaining to the realm of “the right to an individual car” seem to be at the core of many anti-compact arguments. Perhaps less evident, but even more important, is the role of transportation in equity, particularly in developing countries.

The role of automobile transportation in urban sprawl has been well documented in the case of North American, Australian and New Zealand cities (Arbury, n.d.). But there is considerable diversity in its impact elsewhere. For instance, in Western Europe and Japan, where urban growth is minimal, suburbanization and auto-centered transport systems have been associated with higher population densities and multi-modal transportation systems (Martin, 2005, p. 125). However, the role of the automobile in developing countries tends to be much more damaging, both because of its social impacts and detrimental effects on the development of the public transport systems.

For developing countries faced with rapid expansion of their urban population, it would seem that the pattern of automobile-based dispersion is extremely inefficient. Yet, though automobile transportation is accessible to only a small portion of the population, it appears to be prioritized in the transportation plans, processes and road-building activities of a wide variety of places, such as Bangkok, Shanghai, Panama City and Santiago.

Cars are among the most desirable objects of consumption available on the global market and a symbol of success for the upwardly mobile. Their number has increased from 200 million worldwide in 1970 to 850 million in 2006 (Newman and Kenworthy, 2007, p. 67). Its production and consumption has spread quickly throughout the world, with China showing the fastest increases. The automobile industry is heavily marketed and lobbied and has enormous clout everywhere, due to its widespread forward and backward linkages on economic activity and employment.

The power elites and the better-off categories of consumers in all developing countries tend to prefer and demand access to automobile transport, leading to a prioritization of private automobile feasibility in government policies. Such priorities generally lead to car-centred transport systems, to the detriment of other forms of transit and public transportation systems.

The multiplication of private car use leads to congestion and reduced efficacy. The usual response to traffic congestion, road accidents, pollution and energy costs is to build more road capacity for automobiles, at enormous cost and with further perverse effects on public transportation and other forms of transit. Such approaches, borrowed from the lexicon of urban planning in developed countries and from the priorities of transportation engineers, are bound to exacerbate environmental degradation and social inequity, while also impairing economic growth in poorer countries.

From an economic standpoint, since the priority accorded to car transportation directly affects the efficacy of public transport systems, it increases the number of hours spent by workers in their journey to work, thus affecting their quality of life and their productivity. The cost of building roads and highways, as well as of providing the physical space that automobiles require for roads and parking, is considered to be the biggest economic impact (Newman and Kenworthy, 2007, p. 83).

The majority of the population in developing countries evidently does not have the economic resources to access this form of transportation, leading to social fragmentation and increased inequity. The environmental impacts of increased car use and motorized urban sprawl are also significant, ranging from polluted air, energy costs, extravagant land use and invasion of farmlands and ecological reserves (Martin, 2005, p. 122; Newman and Kenworthy, 2007, p. 67). “The car is a high user of land because its use tends to be individualized and privatized, and because its operation requires multiple, dedicated sites... Cars demand more land area than other transport modes by large multiples” (Martin, 2005, p. 124).

In order to give sustainability a chance in the anticipated future doubling of the urban population in Africa and Asia, priorities in the structure of urban transportation will obviously have to be redefined within a more organic vision that incorporates social, spatial, environmental and economic issues. Greening and democratizing transportation in rapidly growing cities is not just political correctness, it is at the core of societal subsistence. Both local and regional governments need to come up with visionary plans based on ample consultations and solid information. Political leaders need the foresight and charisma to overcome eventual obstacles and to sell greener and more equitable approaches to different audiences.

In this light, the recent experience of Bogota is enlightening. Facing gigantic traffic problems, as well as increasing social disturbances, two successive mayors undertook unconventional approaches that

not only greatly improved the traffic problems but also uplifted the face of the city. The technical solution initially proposed to fix Bogota's monumental traffic woes were the usual: build billions of dollars' worth of freeways and overpasses. Instead, Bogota's mayors chose to focus on rapid bus transport (following the Curitiba model) and to free up many of the streets and sidewalks (routinely used as parking spots) for bicycle traffic and pedestrians. Meanwhile, investments in parks and other public places, coupled with better and cheaper transport, also gave the majority of the city's population access to a much improved range of leisure activities. Evidently, this inversion of social and transport priorities initially met with considerable opposition, but the end result was a notable improvement in the quality of life for all (UNFPA, 2007, p. 75).

E. POLICY IMPLICATIONS: "PROCESS" OR INTERVENTION? THE NEED TO PLAN AHEAD

There is little indication that ongoing urban growth in developing countries is fulfilling its social and environmental potential. Given the forecasted doubling of urban population in Africa and Asia, such failures represent a major opportunity lost. In principle, there is no question that urbanization is critical for overall poverty alleviation (UNFPA, 2007, chapter 3). Urban proximity and concentration not only favour economic dynamism but also the provision of infrastructure and services at a much lower per capita cost to urban inhabitants. Nevertheless, urban poverty is growing faster than rural poverty; a significant part of that poverty would be preventable if proactive and effective policies were adopted in attending to the land and housing needs of the poor.

Similarly, urban concentration can constitute an important ally for sustainability. With a world population of 6.7 billion, growing by close to 80 million a year, demographic concentration in densely-populated urban areas actually favours the protection of rural ecosystems. Moreover, cities are the major source of critical technological innovations that can benefit the environment. Nevertheless, present patterns marked by the disordered spatial expansion of cities—an expansion that uses up more land than necessary, that encroaches upon valuable agricultural or ecological riches, that generates biologically sterile expanses of built-up land and that squanders biomass—also fail to maximise the potential benefits of concentration. The amount of land area that is increasingly being appropriated for urban land use is not negligible, nor is the environmental loss it causes (UNFPA, 2007, chapter 4).

Taking full advantage of the potential benefits of urbanization would require a range of initiatives from the political, social and economic domain that far surpass the scope of this paper. The point being made here is simply that the social and sustainable use of urban space would, in and of itself, make a significant difference in the welfare of people and in environmental outcomes. Moving in that direction will require foresight to orient the use of urban land within an explicit concern for both social and environmental values. This would seem applicable to both the intra-urban use of land as well as to the broader expansion of urban land uses across different ecosystems.

In this connection, it is undoubtedly interesting to observe that the World Bank—one of the key institutions in the propagation of the current liberal ethos and its tenet of non-interventionism—has undertaken a broad-based approach to improving urban management with such initiatives as the "Cities in Transition" and the "Cities Alliance" programmes. In this sense, it is noteworthy that a key element of the Cities Alliance strategy is that "cities need to plan ahead in order to make more informed choices about the future and they need to act now" (Cities Alliance, 2007). Similarly, the Cities in Transition strategy paper notes that "Urbanization, when well managed, facilitates sustained economic growth and thereby promotes social welfare gains... But policy weaknesses can disrupt the benefits from urbanization. Policies affecting urban land use and housing investment have major ramifications for households, businesses and the nation..." (World Bank, 2000, p. 2).

More recently, the World Bank sponsored an influential study (Angel and others, 2005) that made a stalwart case for planning ahead in the area of urban growth. Therein, it is asserted that: “the key issue facing public sector decision-makers—at the local, national and international levels—is not whether or not urban expansion will take place, but rather what is likely to be the scale of urban expansion and what needs to be done now to adequately prepare for it...the message is quite clear, developing country cities should be making serious plans for urban expansion, including planning for where this expansion would be most easily accommodated, how infrastructure to accommodate and serve the projected expansion is to be provided and paid for, and how this can be done with minimum environmental impact” (Angel and others, 2005, pp. 91 and 95). The lead author, in a later study, provided detailed suggestions on how city administrations could plan ahead effectively for the land needs of the poor (Angel, 2008).

Until now, planning ahead for rapid urban growth has clearly not been the norm. As noted earlier, policymakers in developing countries seemed to be reluctant to let the inevitable process of urbanization run its course. Given the enormity of the predicted expansion in their urban population, as well as the potential economic, social and environmental implications of this growth, such negativism and the consequent absence of a coordinated proactive approach towards future growth is rather astounding. Angel and others (2005) cited a number of cogent reasons why this is occurring: the short planning horizons of politicians; the unwillingness of most national and local governments to accept urbanization as a positive trend and, thus, to prepare for orderly urban expansion; the preference for ambitious and utopian master-plans that have little prospect for being enacted or enforced; and the fact that international organizations have refrained from engaging in policy dialogue aimed at the design and implementation of effective investment programs (Angel and others, 2005, p. 101).

Beyond these valid explanations, there is also an ethos defined by the present development context, wherein governments are enjoined to let the markets proceed, and to stay out of the way of economic forces as much as possible. In developing country cities, which have often witnessed several layers of “Master Plans” that became outdated before they were ever implemented, the idea that evolutionary processes (i.e., *laissez-faire*), rather than drawing-board plans, should orient the organization of urban space may seem even more attractive.

In such a context, technical people have, in recent times, been admittedly hesitant about proposing long-term orientations for the sustainable use of space. It is pertinent, for instance, that the Millennium Assessment shied away from advocating any particular direction for future urban growth on the grounds that, in a liberal market economy, investors rather than planners make the decisions as to where growth will occur (McGranahan and others, 2005, p. 802).⁹

The extent to which the location and form of urban expansion are amenable to public sector intervention is an issue that would merit considerably more discussion, especially in the context of Africa and Asia. There is a real question as to what margin of manoeuvre national and local policymakers there will have with respect to the sustainable use of space in future urban growth. This margin is established in large part by the nature of political processes, by the relative significance of different political issues in country contexts, and by the extent to which where social advances, rather than personal gain, are a pre-eminent objective of politicians and administrators.

There is also a real question as to the capacity of local governments to diagnose the nature of the problems associated with rapid urban growth and, more importantly, with the nature of the solutions that must be adopted. With few exceptions, local governments are the most unprepared level of decision; they often have a poor understanding of the challenges and a mediocre capacity to propose and implement effective solutions. Moreover, intentions of personal gain often predominate over public goals, especially in the area of land use where corruption seems particularly enticing and resilient to accountability efforts.

This situation is made more complex by overall development goals. Currently, there is little doubt that the effort to reach and maintain high rates of economic growth holds priority on the agenda of most developing countries, with social and environmental issues being relegated to a vague set of postponed desiderata. This seems to give investors, public or private, a bigger voice in decisions as to where and how production will expand, thus essentially determining future patterns of population distribution. Since, in a globalized market, economic opportunities can often be volatile, the possibilities for impressing specific spatial orientations on population distribution appear tenuous.

Nevertheless, environmental awareness and reactions to unsustainable or polluting kinds of growth are having an influence on the location and characteristics of economic activity, even in the context of traditional centrally-planned economies such as China (Bai, 2008). To the extent that environmental awareness is allied to good governance (which includes not only representation of all relevant groups but also good information and analyses as to what can effectively be done), it would still seem possible to influence the direction and the form of urban growth in positive ways. Thus, advocacy for the effective consideration of social and environmental concerns in urban planning appear to be a valid starting point for action.

Such intervention, however, requires clear ideas on what is desirable with respect to the social and sustainable use of space. Ultimately, letting “process” and “indeterminate planning” resolve the future destiny of cities sounds disturbingly like putting our faith in market forces and their ultimate capacity to somehow make everything right in the end. Surely there have to be some overarching concerns, standards, criteria or desiderata on which people already agree and these should be able to help shape urban growth policies in more sustainable ways.

Despite the current standoff on the sprawl versus compact city debate in developed countries, some alternatives for the use of urban space are more sustainable than others and could be recommended in the orientation of future urban growth in Asia and Africa. Thus, most people would agree that urban sprawl (decreasing density) is *per se*, less sustainable, at least in those regions. At a minimum, there would appear to be agreement that the prototypical American suburb should not be reproduced throughout the world. Applying this model, based on individual housing and automobile transport, to rapidly-expanding cities of developing countries does not seem feasible, practical or desirable, especially when viewed in environmental terms.

On the other hand, most of the desiderata cited earlier as part of the formula of compact cities all seem quite valid for the orientation of upcoming growth within a systematic concern with environmental issues: high density, mixed use, intensification of public transportation, greater pedestrian and bicycle transit, utilization of interstitial spaces, protection of natural ecosystems, revitalization of downtown areas, reduction of the amount of land affected by roads and parking lots, increased social and economic interactions and more efficient utility and infrastructure provision.

Perhaps the biggest problem with the compact city approach was less its environmental desiderata than its faith that drawing board designs could concentrate all these advantages in “compact cities” rather than in the urban forms that would result from negotiations among different environmentally-conscious sectors of society.

Within the framework of the broader and non-formal environmental approach suggested by McGranahan, it would seem appropriate to promote the sustainable use of urban space through environmentally-inspired approaches to a variety of interrelated issues. A very partial list, for purposes of illustration might include, *inter alia*:

- ensuring that new developments are properly sited with respect to the conservation of biodiversity, wetlands, watersheds and other resources, as well as other sensitive or valuable lands;
- taking a proactive and effective stance to attend to the land and housing needs of the poor, thereby relieving human poverty and misery while also contributing to the sustainability, quality of life and economic attractiveness of the city;
- emphasizing public transport over private automobile use. Changing the transportation paradigm by financing public transportation projects, and eliminating subsidies to automobile traffic would seem to be absolutely essential in practically all urban contexts of developing countries;
- ensuring the existence and effective management of facilities for waste collection treatment and disposal;
- promoting recycling, restriction of carbon emissions and energy use;
- ensuring provision of clean water and sanitation and other key environmental services;
- maximizing access by all to wide urban swaths of public space, and guaranteeing the preservation of diverse and diversified green spaces; and
- allowing natural processes to generate diversity, beauty and health, laying to rest the conception of cities as biologically sterile environments and learning to use the enormous water, energy and nutrient resources that are the by-products of urban drainage, sewage disposal and other functions of city processes.

NOTES

¹ For instance, Latin America accomplished an urban epidemiological transition over a much shorter period of time through a combination of macroeconomic improvements and preventive health measures. “The more urbanized the country, the faster mortality rates fell” (Stephens and Stair, 2007, p. 141)

² Admittedly, not all slum dwellers are “poor” and not all poor urban residents live in “slums.” Nevertheless, the orders of both categories’ magnitude is sufficiently compatible for present purposes.

³ The number of countries reporting that they had policies to curb migration towards urban agglomeration rose steeply from 51 per cent in 1996 to 73 per cent in 2005 (United Nations, 2006b).

⁴ The study by Angel and others (2005) assumed an average density of 8,000 per km² in developing countries and 3,000 per km² in industrialized countries.

⁵ This may actually be a low estimate of declining densities. In the United States, at least, a study of 282 metropolitan areas found that the growth of land area outpaced population growth two to one (Reported in Hogan and Ojima, 2008).

⁶ Since these ecosystem data do not consider lifestyles, consumption patterns or ecological footprints, they evidently provide only broad indications of the nature and extent of “damage” that can be caused by urban expansion. Nevertheless, they provide useful indications as to what types of ecosystems are most affected by urban growth in different regions.

⁷ This section is largely based on a literature review prepared by Martine and Odelius in preparation for UNFPA (2007).

⁸ Gordon McGranahan, IIED (International Institute for Environment and Development), London. Personal communication, May 12, 2007.

⁹ It should be noted that, despite its reticence to interfere with market forces, the Millennium Assessment did recommend that urban growth should be restricted where it threatens ecosystem services such as watersheds or ecologically fragile areas (McGranahan and others, 2005, p. 802).

¹⁰ The data base does not discriminate between urban and rural areas of municipalities. However, since Brazil is now 83 per cent urban, according to official data, the size categories of municipalities are a fairly good proxy of urban size categories.

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LIVING WITH SHELTER DEPRIVATIONS: SLUMS DWELLERS IN THE WORLD

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A. INTRODUCTION

In 2008, humanity witnessed a significant event in its history. For the first time, the world's urban population equalled the rural population. This historic milestone represented both a demographic change and more importantly, a social, cultural and economic transformation. This change is more remarkable considering that, two hundred years ago the world's population was overwhelmingly rural, with less than three per cent living in cities (UN-HABITAT, 2006).

Urban growth began to accelerate in the 1950s when the urban population accounted for 29 per cent of the world's population (United Nations, 2008b). Since then, humanity has witnessed the fastest urban growth ever experienced. This urban transition will undergo further progress during the twenty-first century, with largely rural regions, mainly in Asia and Africa, becoming predominantly urban.

The urban transition has changed the landscape of cities in the world. In 1900, there were about 12 cities with populations greater than one million; now, there are more than three hundred with similar or larger populations. If the twentieth century was characterized by an accelerated urban sprawl and the appearance of megacities, the twenty-first century may be considered as the century of "metacities" –massive conurbations of more than 20 million people. These large agglomerations are gradually swallowing up rural areas and adjacent cities and towns. Spurred by economic development and population increase, they are becoming multi-nuclear entities counted as one. Metacities have populations larger than some countries. The population of Greater Mumbai (which will soon achieve the status of a metacity) is already larger than the total population of Norway and Sweden combined (UN-HABITAT, 2006).

Big cities are important not only because of their size, but because their scale creates new dynamics and complex interactions between different demographic, social, political, economic, and ecological processes (IUGS, 2007). These cities are playing a significant role in creating wealth, enhancing social development and attracting investments. São Paulo, Brazil's largest city, and Bangkok, the capital of Thailand, both host just over 10 per cent of the total population of their respective countries, but both cities account for more than 40 per cent of their countries' gross domestic product (GDP) (UN HABITAT, 2006). Goods and services are generally produced and distributed more efficiently in densely populated areas; but, it is also in these areas that one can see and smell the effects of overcrowding, pollution and unsanitary living conditions that are so prevalent in cities of the developing world. It is also in these large cities that pronounced levels of poverty, social inequality and environmental degradation exacerbate the vulnerability of populations. Big agglomerations with high levels of exclusion, ethnic division, segregation and growing disparities can be more prone to crime, insecurity and conflict.

The world's largest cities, that is, cities of more than 5 million inhabitants, were home to only about 7.5 per cent of the world's population in 2007 and they are growing at a rate of about 2.2 per cent annually in 2005-2010 (United Nations, 2008). Note that this growth rate is almost

double that of the total population and higher than that of cities of less than 5 million inhabitants.

Small towns with less than 500,000 inhabitants and intermediate cities with between 1 and 5 million inhabitants are home to around 73 per cent of the world's population (53 and 22 per cent, respectively)². Furthermore, it is predicted that small and intermediate cities will grow at a faster rate than any other type of city, absorbing half of the world's urban growth in the next two decades (United Nations, 2008)

Unfortunately, very few of these small or intermediate cities are prepared to confront the urban challenge. A study conducted by UN-HABITAT showed that 70 cities out of 120 in the developing world recognized that they did not have means to properly monitor the urbanization process; therefore, they did not know to which extent urban growth could be attributed to poor informal settlements and slum growth.³ This information gap cannot be solely credited to the lack of measurement tools, it also reflects a problem of awareness about urbanization challenges and unwillingness by local authorities to recognize, and consequently to address, urban poverty issues.

B. THE URBANIZATION OF POVERTY

Urbanization is a powerful and irreversible process. Nevertheless, it is still common for policy-makers and even some analysts to declare that the growth of cities can be stopped by creating conditions for peasants to remain in rural areas. This perception is based on the assumption that cities are burgeoning with rural in-migrants. However, this is not the case in most parts of the world. Except for relatively few countries (e.g. Bangladesh, China and Indonesia, among others) rural-to-urban migration is not a major urban growth factor. Natural population increase and reclassification of rural areas into urban areas are more significant contributors to urban growth (Stecklov, 2008).

Less developed countries are urbanizing rapidly. In terms of absolute numbers, the growth of cities in the developing world has been close to ten times that of cities in the developed world. In terms of annual urban growth rates, cities in the developing world grew at an average rate of 2.5 per cent between 1990 and 2000, compared to an average rate of 0.3 per cent in the developed world.⁴

Urbanization in many developing countries raises red flags, particularly because of an increased number and proportion of city residents living without improved water and/or sanitation, and in houses without sufficient living space and adequate structure. Yet, most countries rely on income or consumption poverty lines for assessing poverty with an international threshold of one dollar or two dollars a day. However, studies have shown that the use of one dollar or two dollars a day poverty line measure underestimates urban poverty. Educated estimates suggest that around 30 to 60 per cent of urban dwellers in the developing world are living in poverty. Among the consequences of urban poverty are the following:⁵

² Figures were taken from the *United Nations Demographic Yearbook* (various years).

³ UN-HABITAT database 2005, Urban Indicators Programme.

⁴ Estimations made by UN-HABITAT using data from the United Nations *Demographic Yearbook* (United Nations, issues 1990 to 2005). The calculations refer to cities with population over 100,000 inhabitants in the period 1990-2000. On the basis of the cited United Nations data, urban growth change of the total urban population has been estimated as 2.7 per cent for the developing world and 0.5 per cent for the developed for the years 2000-2005.

⁵ Mehta Dinesh, "The urbanization of Poverty", In: Habitat Debate, Vol. 6, Num. 4, Nairobi, 2000. ESCAP "Facing the Challenges of Urbanization and Urban Poverty in Asia and the Pacific", Committee on Poverty Reduction, Bangkok, Fourth session 12-14 December 2007.

- large and growing backlogs in the delivery of basic services as demand outstrips institutional capacity and financial resources;
- the worsening state of access to adequate shelter with security of tenure, resulting in severe overcrowding, homelessness and poor environmental conditions;
- increased vulnerability to environmental health problems, environmental shocks and natural disasters;
- lack of substantial productive assets (such as land and housing), limited access to social safety nets;
- sharp intra-city inequality, manifested in stark residential segregation, escalating violence and social unrest, which impact women and the poor disproportionately;
- lack of participation of communities in decision-making processes and in the implementation of activities;
- lack of political power, participation, dignity and respect.
- vulnerability among women, children and youth.

In the Latin America and the Caribbean region, the number of urban poor surpassed the number of rural poor in the late 1980s. According to the World Bank, between 1970 and 1990, the number of poor persons in cities and towns increased from 44 million to 115 million, while the number of rural poor, increased from 75 million to 80 million (World Bank, 2002). As reported by the Economic Commission for Latin America and the Caribbean (ECLAC), the prevalence of poverty (i.e., the percentage of the population below the poverty line) has generally declined in the region since the early 1990s, and although the urban poverty rates continue to be much lower than poverty rates in the rural areas, the absolute number of poor people are, increasingly, residents of urban areas (ECLAC, 2008).

Africa is the poorest region of the world. Rural poverty is pervasive in the region, and more than 40 per cent of the urban population in many countries, particularly in sub-Saharan Africa, lives below the poverty line. While it is recognize that rural poverty is more prevalent than urban poverty in most Sub-Saharan African countries, the World Bank estimates that there are countries in which rural and urban poverty prevalence is almost the same, this include for instance Nigeria, Chad, Niger and Sierra Leone (World Bank, 2007). If current trends were to continue, sub-Saharan Africa would be the only region where the number of people living in extreme poverty would increase by more than 100 million between 1990 and 2015 (African Development Bank and World Bank, 2002). It is estimated that 40 to 50 per cent of the poor will be living in urban areas by 2015, and two out of five of the urban residents will be living in circumstances deemed to be life- and health-threatening.⁶ Only four African countries managed to sustain high economic growth rates in late 1990s and early 2000. In most of the other countries the optimism of positive economic growth was hampered by domestic and external debt, poor governance, continuous civil strife and poor weather conditions that led to a reversal in performance. In this environment of economic decline or poor growth, further impoverishment of the urban populations is expected.

In Asia, urban growth is accompanied by urban poverty. The Economic and Social Commission for Asia and the Pacific estimates that around 641 million people in the region are living on less than one dollar a day. It is difficult to determine exactly how many of them live in rural areas, but estimates range from 65 to 80 per cent. If that is the case, the urban poor, defined here on the basis of income alone number between 130 and 210 million (ESCAP, 2007). For instance, the World Bank estimates that rural poverty in South Asia (both the proportion and number of poor people) is declining, while urban poverty has been increasing from 110 million

⁶ UN-HABITAT Global Urban Observatory, global database, 2005.

people in 1993 to 167 million in 2002 (Ravaillon and others, 2007). Of course, the magnitude of urban poverty cannot be estimated in terms of income only, and even less in terms of a one-dollar-a-day poverty line. UN-HABITAT estimated that in 2005, approximately one in three Asians were living with shelter deprivations, representing close to 900 million people or roughly two-thirds of the world's population living below the poverty line, most of them lived in rural areas (López-Moreno, 2002). In recent years, East Asia, and especially the People's Republic of China, performed well in reducing poverty, particularly rural poverty. However, it is expected that with rapid urbanization and expansion of urban-based economic activities will contribute to increasing the number of people living with shelter deprivations (UN-HABITAT, 2006).

Poverty has also risen steeply in the countries of Eastern Europe as this region struggles with the transition towards a market economy. Cities that relied heavily on industrial production are experiencing record levels of unemployment as factories shut down and production is curtailed.⁷ At an aggregate level, the increase in poverty can be attributed to a fall in average real incomes and a rise in income inequality. While average real incomes initially declined in all transition economies, levels of income inequality have differed dramatically across the region. As measured by the Gini coefficient, inequality has increased by about 25 per cent in Central Europe and of almost 100 per cent in several other transitional economies, including Bulgaria, the Russian Federation and Ukraine (World Bank and International Monetary Fund, 2001). In North America and Western Europe, most of the population, and thus most of the poverty, has been concentrated in urban areas since the beginning of the previous century.

Global estimates suggest that the number of urban residents living with shelter deprivations will continue to increase in most developing countries. Empirical evidence suggests that the proportion of urban poor will increase at the same rate as the urban population growth, and in some regions, such as sub-Saharan Africa, Southern and Western Asia, perhaps even faster. In a rather moderate projection, it is estimated that the proportion of poor in the population will remain unchanged between now and 2020, so that the absolute number of poor living with shelter deprivations, as measured by UN-HABITAT, will increase to more than one billion people, as compared to 675 million in 2005.⁸

There is no doubt then that urban poverty requires the urgent attention of policymakers. There is strong empirical evidence that, as the population as a whole urbanizes, poverty is naturally becoming more concentrated in urban areas as well. Unless urban poverty is addressed, continued urbanization can result in increases in urban poverty and inequality. Without decisive action, the number of slum dwellers in the world will probably continue to grow. This may have profound consequences for cities as a whole, as growing inequalities can strain the ability of cities and countries to prosper and develop. Inequalities can affect relations between different social and economic groups and may lead to rising levels of insecurity, which in turn could lead to conflict.

C. SLUMS: THE FACE OF URBAN POVERTY

Poverty can be understood using various approaches that encompass different dimensions and expressions of deprivation. Some of these focus primarily on the extent to which basic human needs are met, while others emphasize consumption patterns and the calorie requirements set by

⁷ International Labour Organization (ILO), United Nations, "Unemployment threatens world cities", Web page, 1996. http://www.ilo.org/global/About_the_ILO/Media_and_public_information/Press_releases/lang--en/WCMS_072016/index.htm.

⁸ Estimations made based on World Urbanization Prospects: the 2007 Revision, UN DESA, 2008.

international organizations. The most common definition used by development agencies refer to a monetary value of a basic “basket of needs”, for example, the World Bank’s one-dollar-a-day poverty line. These definitions do not incorporate concepts such as freedom, human rights, participation and other issues related to governance that are essential to human development. Thus, the income poverty concept is limited in that it does not capture broader opportunities and constraints to achieve wider human goals.

Poverty can also mean social exclusion (deprivation of opportunity to participate in society or a progressive deprivation of resources and of social links). It can also mean disadvantage in access to resources, human misery, dependency, social instability and economic morbidity.⁹ Lastly, poverty is related to social indicators such as life expectancy, infant mortality, levels of nutrition, the proportion of the household budget spent on food, literacy, school enrolment rates, access to health clinics and drinking water, and levels of social and political participation, among other indicators.

Urban poverty in particular, is a phenomenon with different characteristics and expressions, such as: unemployment, the unequal distribution of wealth, racism and xenophobia and residential segregation, among others. This phenomenon is also different in urban areas from the rural settings, which calls for urban and rural poverty indicators and solutions. At the same time, it is now recognized that rural and urban poverty are interrelated, and there is a need to consider both concepts together for they have many structural causes in common, e.g. socially constructed constraints to opportunities (class, gender) and local trade opportunities.¹⁰

Nonetheless, in all these definitions and approaches, poverty refers to forms of deprivation and social differentiation. When the world adopted the Millennium Declaration in 2000,¹¹ urban poverty was brought to the stage of global development, and it was included among the agreed development targets and indicators.

The slum target, known as “Cities without Slums” or “Target 11” helped to focus the international community’s attention on the living conditions of the urban poor. Slum dwellers experience multiple deprivations that are direct expressions of poverty. Many of their houses are unfit for habitation and they often lack adequate food, education, health and basic services—things that those who are better off take for granted. Frequently, their locations (neighbourhoods, residential areas, etc.) are not recognized by local and central authorities. However, in various parts of the world these “informal” settlements are growing faster than the “formal” ones. Unfortunately, in many cities and countries, slums are still “*zones of silence*” or invisible in terms of public knowledge, opinion and discussions about urban poverty.¹²

Target 11 aims, “*By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers*”. When this Target was set, 100 million seemed like a big number, close to the amount of people that was estimated to be living in deprived conditions in the different slums of the world. Yet, after UN-HABITAT, the agency responsible for assisting

⁹ Fadila Boughanémi, Nicole Dewandre, European Commission, DGXII, G-5, Social Research, 2001.

¹⁰ Many point to the important connections between the two, as household livelihood or survival strategies have both rural and urban components. Refer to Masika Rachel, de Haan Arjan and Baden Sally, *Urbanisation and Urban Poverty: a Gender Analysis*, Swedish International Development Cooperation Agency, Report 54, October 1997.

¹¹ In September 2000, the international community adopted the Millennium Declaration. The Declaration is basically about development, linked to peace, security, human rights and governance. Refer to <http://www.un.org/millennium/declaration/ares552e.htm>.

¹² López Moreno Eduardo, *Slums of the World: the Face of Urban Poverty in the New Millennium*, UN-HABITAT, 2002.

Governments in monitoring and reaching the “Cities without Slums” target, operationalized the concept of slums that was agreed upon by the international community, it found that the first estimate of the number of slum dwellers in the world was much higher than the 100 million, reaching 924 million people in 2001.¹³ Target 11 was therefore very low if compared the total number of urban residents living in slum conditions in the world.

D. SLUM-DWELLERS: CLOSE TO THE ONE BILLION MARK

According to UN-HABITAT’s estimates, one out of every three city dwellers—nearly one billion people—lives in a slum at present. For many years, governments and local authorities viewed slums as transient settlements that would disappear as cities developed and incomes of slum dwellers improved. However, evidence shows that slums are growing and becoming permanent features of urban landscapes. Slums have carved their way into the fabric of modern-day cities, making their mark as a distinct category of human settlement that constitutes a space between “rural” and “urban” (UN-HABITAT, 2006).

Slums are not always isolated areas or neighbourhoods housing a relatively small proportion of the urban population. In many cities, particularly in Southern Asia and sub-Saharan Africa, they host significantly large proportions of the urban population and slum growth is virtually synonymous with urbanization. In these cities, slums are entirely marginalized neighbourhoods, and in some cases they spread throughout the city landscape, creating real “slum-cities”, where almost all the population live in slum conditions and even the rich or non-slum population is affected by living in neighbourhoods with inadequate urban services and poor environmental conditions.

Slums are proliferating in many parts of the developing world or they continue to exist sometimes for more than one or two generations in some cities. That is why they should not only be seen as a type of informal growth, but as a new paradigm of human settlement that calls for a new categorization: *urban slums*. This categorization will help to distinguish the urban poor from the rest of the urban population and even from the rural poor, describing the reality of people’s life in these informal poor settlements. This new category will also help to go beyond the simple duality that exists in the traditional framing of human settlement types: rural and urban, creating conditions to understand, quantify and appraise these poor settlements. Policies and actions could therefore be better focused on the urban poor with sound and permanent monitoring mechanisms that would allow us to know where and how their living conditions are changing.

In 2003, the world came to learn that the slum population was close to the one billion mark (924 million people in 2001).¹⁴ The proportion of the urban population living in slums varies by region. In broad terms, seven out of ten urban residents were slum dwellers in sub-Saharan Africa, the region that had the highest prevalence of slums in the world in 2001. Asia was second with four inhabitants out of every ten living in slum conditions in urban areas in the same year. Latin American and the Caribbean was the developing region with the lowest

¹³ UN-HABITAT and its partners, who were represented in the Expert Group Meeting organized in Nairobi in October 2002, are cognizant of the fact that under these universally applicable generic concepts and definitions, there are marked local variations, and that each country or city should be allowed to adjust to the given universal framework.

¹⁴ A slum household is defined as a group of individuals living under the same roof lacking *one or more* of the following conditions: Access to improved water; Access to improved sanitation; Sufficient-living area; Durability of housing; Security of tenure.

incidence of slum dwellers with one-third of the total urban population living in these precarious settlements. Important variations are also found in the different sub-regions and countries inside these regions (table 1).

TABLE 1: URBAN AND SLUM POPULATION IN THE DEVELOPING WORLD (1990-2001)

Region	Total population (millions)		Total Urban population (millions)		Percentage Urban population		Urban slum population (millions)	Percentage of urban slum population
	1990	2001	1990	2001	1990	2001	2001	2001
World	5,255	6,134	2,286	2,923	43.5	47.7	924	31.6
	4,106	4,940	1,439	2,022	35.0	40.9	874	43.0
Africa	619	683	198	307	31.9	44.9	187	60.9
Northern Africa	118	146	58	76	48.7	52.0	21	28.2
Sub-Saharan Africa	501	667	140	231	27.9	34.6	166	71.9
Latin America and the Caribbean	440	527	313	399	71.7	75.8	128	31.9
Asia (excluding China)	3,040	3,593	928	1,313	30.5	36.5	554	42.1
Eastern Asia	1,349.6	1,364	445	5,331	33	39.1	193	36.4
South-central Asia	1,225.5	1,505	333.7	4,524	27.2	30.0	262	58.0
South-eastern Asia	439.8	5,297	139	2,028	31.6	38.3	56	28.0
Western Asia	153.4	1,924	93.7	1,249	61	64.9	41	33.1
Oceania	6	8	1	2	23.5	26.7	5	24.1

Source: UN-HABITAT Global Urban Observatory, 2008

E. AFRICA, THE HIGHEST PREVALENCE OF SLUMS IN THE WORLD

In Africa, 61 urban residents out of 100 were living in slum conditions in 2001. A notable disparity exists between Northern Africa and sub-Saharan Africa, with the former having a relatively low proportion of slum dwellers, accounting for 28 per cent of the urban population, and the latter having the highest proportion of slum dwellers in the world, 71.9 per cent.

In some countries like the Central African Republic, Chad, the Congo, Ethiopia, Guinea-Bissau, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Sierra Leone, Somalia, Uganda and Tanzania, nearly all the population living in cities and towns were considered to be living in a slum household, which means that the individuals living under the same roof had one or more of the five characteristics of slum dwellings. This astonishing high prevalence of slums is in line with findings by other human development indicators and global poverty monitoring indices that classify these countries as being among the poorest of the Less Developed Countries (LDCs). Interestingly, country reports on poverty, such as the Poverty Reduction Strategies, estimate the levels of urban poverty in these countries to be around 30 to 60 per cent (for example, the Ethiopian document estimates urban poverty at 30 per cent and the Chadian strategy paper at 60 per cent). It is clear therefore that slum incidence is strongly related to poor access to adequate shelter and basic services, and not necessarily to income poverty per se.¹⁵

¹⁵ Refer to the “Sustainable Development and Poverty Reduction Programme”, published by the Ministry of Federal Affairs in Ethiopia in 2002, and the “Interim PRSP”, Government of Chad, 2000. López Moreno Eduardo, “Slums of the World: the Face of Urban Poverty in the New Millennium”, UN-HABITAT, 2002.

In a second group of countries, including Angola, Benin, Burkina Faso, Senegal and 24 others, the proportion of the population living in slums ranked from 50 to more than 80 per cent in 2001. Most, if not all of these countries, are less developed countries, and, on average, 62 per cent of their urban population were living in slums in 2001.

A third group is composed of a limited number of countries that had one-third or less of their urban population living in slums. Three of these countries are in Northern Africa: Tunisia (3.7 per cent), Algeria (12 per cent) and Morocco (32 per cent) and one in sub-Saharan Africa, Zimbabwe, with the lowest incidence of slums in Africa (3.4 per cent) in 2001. These countries, particularly those in North Africa, confirm the notion that the lower the proportion of informal settlements, the higher the social and economic development of the country, as measured by the Human Development Index, the GDP per capita or other similar indicators. For instance, GDP per capita in Algeria and Tunisia was PPP US\$6,090 and US\$9,390, respectively, in 2001, five times higher than the average GDP per capita in the LDCs that was PPP US\$1,274 (UNDP, 2003). Zimbabwe constitutes an exception, with a per capita GDP of PPP US\$2,280. However, this country was one of the few countries that had a very early fertility transition with relatively low levels of infant mortality compared to other sub-Saharan African countries (Gora, 1999).

F. ASIA, ONE OUT OF TWO SLUM DWELLERS IN THE WORLD ARE FROM THIS REGION

In Asia, 42 per cent of the continent's 1.3 billion urban residents lived in slums in 2001. In absolute numbers this meant that one out of two urban slum dwellers in the world were in Asia (López-Moreno, 2003). Southern Asia appeared to be the poorest sub-region in the continent, having the greatest incidence of slums in the region (58 per cent) in 2001. The highest proportion of slum dwellers was found in Afghanistan (98 per cent), Nepal (92 per cent), Bangladesh (84 per cent) and Pakistan (73 per cent), countries that also have the highest infant mortality rates and other similar poor social indicators. However, in absolute numbers, India and Pakistan accounted for nearly three-fourths of the slum population in the sub-region, with 194 million people living in poor informal settlements (158 and 36 million, respectively). Slum prevalence was remarkably low in Sri Lanka, with only 13 per cent of the country's urban population living without adequate water and sanitation largely due to effective housing programmes that the government has been implementing since the 1970s.¹⁶

Slum prevalence was also high in Eastern Asia, with 36 per cent of the sub-region's urban population living in informal settlements in 2001. Mongolia was the only country where slightly less than two-thirds of the urban population was living in slums, but in absolute numbers China's slum population accounted for more than half of the sub-region's slum population.

Slum dwellers in South-eastern and Western Asia represented around one-third of their respective urban populations, that is, slum prevalence was relatively low in these two regions. In South-east Asia, Cambodia and Lao People's Democratic Republic have high incidence of slum dwellers, reaching 72 and 66 per cent of the urban population, respectively, whereas in Western Asia the proportion of the urban population living in slums varies significantly among countries. In Bahrain and Kuwait slum dwellers constitute less than 2 per cent of the urban population, in Syria and Saudi Arabia they constitute between 10 to 20 per cent, and in Lebanon and the Occupied Palestinian Territory they comprise slightly more than 50 per cent of the urban population (UN-HABITAT, 2008).

¹⁶ Referring for instance to the One Hundred Thousand Housing Programme and the One Million Housing Programme implemented since the 1970s to upgrade and prevent slums formation.

G. LATIN AMERICA AND THE CARIBBEAN, A VERY DIVERSE REGION IN TERMS OF SLUM DWELLERS

In Latin America and the Caribbean, one-third of the total urban population was living in slum conditions in 2001. But in countries like Haiti and Nicaragua, more than 80 per cent of the urban population was living in slums. In Belize, Bolivia, Guatemala and Peru, slums hosted two-thirds of the urban population. In another seven countries that include Argentina, Brazil, Dominican Republic, El Salvador, Jamaica, Panama and Trinidad and Tobago the proportion of slum dwellers reached one-third of the urban population, whereas in Chile, Costa Rica, Uruguay and various Islands from the Caribbean, slums dwellers represented less than 15 per cent of the country's urban population. The region is anything but uniform in terms of slums and other human development indicators.

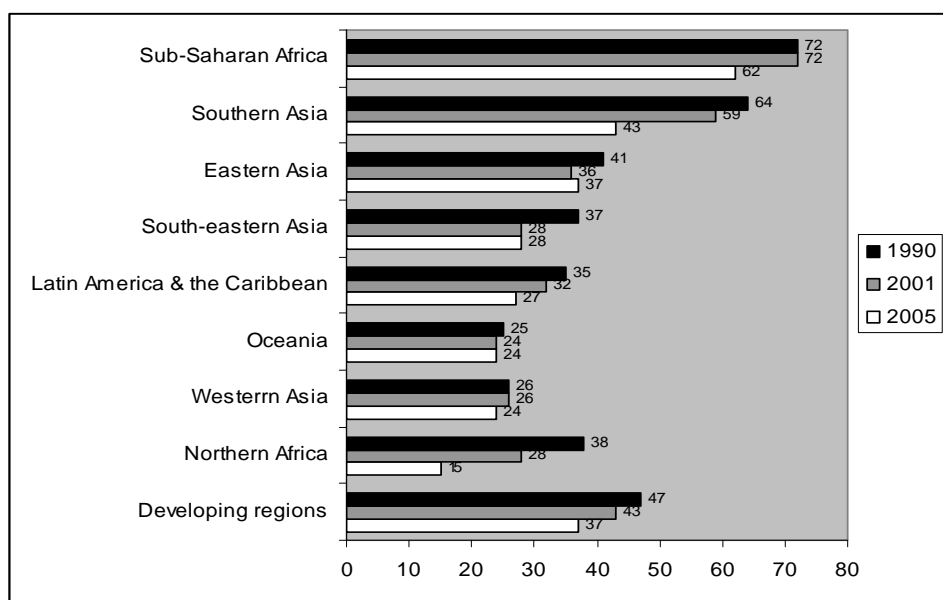
H. SOME COUNTRIES ARE MAKING PROGRESS ON THE SLUM TARGET, OTHERS ARE JUST BENEFITING FROM CHANGES IN THE DEFINITION OF SLUMS

In 2006, the Joint Monitoring Programme for Water Supply and Sanitation decided to change the definition of adequate sanitation—one of the five slum indicators—in order to adapt it to the reality of more dense urban settings. The World Health Organization (WHO), the United Nations Children's Fund (UNICEF) and UN-HABITAT agreed to consider pit latrine with slab as improved sanitation. In previous slum estimates, pit latrines were considered as non-improved sanitation regardless if they were with slab or not. The change in definition affected estimates mostly in those countries where the use of pit latrines is more widespread, particularly in sub-Saharan Africa.¹⁷

In the last five years, some countries around the world have been more successful than others in reducing the number and proportion of slum dwellers. Various other countries have benefited from the change in definition, which led to reduced estimates of slum households, without really implementing policies and actions to improve the lives of slum households. Because of these two factors, the number of slum dwellers declined from 924 million in 2001 to 810 million in 2005. Concomitantly, the proportion of slum dwellers in the total urban population in developing countries was reduced from 43 per cent in 2001 to 39 per cent in 2005. As shown in figure 1, the most significant reduction took place in Northern Africa, the proportion of slum dwellers declined from 28 per cent to 15 per cent of the urban population. An even higher reduction in the proportion of slum households was observed in Southern Asia, where the proportion of slum dwellers declined by 16 percentage points. However, such proportion is still quite high in this sub-region, at 43 per cent in 2005. Meanwhile, sub-Saharan Africa, which recorded a reduction of 10 percentage points in the proportion from 2001 to 2005, continued to have the highest proportion of slum dwellers in the world (62 per cent). Latin America and the Caribbean experienced a moderate reduction in the proportion of the urban population living in slums, from 32 per cent in 2001 to 27 per cent in 2005 (see figure 1).

¹⁷ Mboup Gora, communication published as footnote in the "The Millennium Development Goal Report 2007", United Nations, 2007. Mboup is the UN-HABITAT focal point for the MDGs.

Figure 1. Proportion of the urban population living in slum conditions, 1990, 2001 and 2005



Source: Global Urban Observatory (GUO), 2008

I. AFRICA, DRAMATIC CHANGES WITHOUT REAL IMPROVEMENTS IN MANY COUNTRIES

Africa as a whole has the highest urban growth rate in the world—4 per cent per year, similar to the rate of growth in the slum population. In 2005—according to the revised definition—6 out of 10 urban residents were slum dwellers, nearly double that of the rest of the developing world. Yet an interesting disparity exists between Northern Africa and sub-Saharan Africa, with the former having a prevalence of slums of around 15 per cent and the latter of around 62 per cent (UN-HABITAT, Global Urban Observatory, 2008).

Despite the fact that the change in the definition of sanitation contributed to reducing the number of slums dwellers in most countries of the region (and also in the region itself in aggregate numbers), it is interesting to note that in various post- or on-going conflict countries, the proportion of slum dwellers continues to rise. While countries like Angola, Côte d'Ivoire, Sierra Leone and the Sudan experienced an increase in the incidence of slums of between 4 and 8 per cent from 1990 to 2005, the Democratic Republic of the Congo (DRC) had a remarkable growth of its slum population by 25 per cent in the same years.¹⁸ The political crises in Zimbabwe, the country with the lowest slum prevalence in sub-Saharan Africa, caused an increase in its slum population from 3.4 per cent of the urban population in 2001 to 18 per cent in 2006, an increase that is attributed largely to overcrowding.¹⁹

UN-HABITAT policy analysis on slum improvements in the region shows that various countries are taking active steps to improve the lives of their slum populations and are reducing

¹⁸ The number of slum dwellers in DRC grew from 52 per cent in 1990 to 76 per cent in 2005 (UN-HABITAT Global Urban Observatory 2008).

¹⁹ UN-HABITAT, Global Urban Observatory 2008, using DHS data from a household survey conducted in 2006.

both the proportion and number of people living in low-income informal settlements. Egypt, Morocco, South Africa and Tunisia are among the few African countries that are seriously addressing the problems of slums. Burkina Faso, Ghana, Namibia and Senegal are also implementing important policy actions that may yield positive results in the near future. A positive trend of slum reduction is already being observed in these countries. These successful cases give hope to others; they convey a clear message that it is possible to achieve progress on the Millennium Development Goals' slum target of improving the lives of at least 100 million slum dwellers by 2020.

Many other sub-Saharan African countries benefited from the change of the definition of sanitation and appeared to have had an impressive reduction in the slum population; yet, no real change in the living conditions of this population seems to have really occurred. This is

the case, for example, with Malawi that had a large number of households in urban areas with traditional pit latrines as sanitation facilities. In 2001, this type of sanitation solution was considered as non-improved, and households using them were recorded as slum dwellers. In 2005, with the change in definition, 50 per cent of these households were counted as non-slum dwellers and since they represented a staggering 76 per cent of the country's urban population, or 1.7 million people, the high incidence of slum population dramatically reduced from 94 per cent in 1990 to 66 per cent in 2005. A similar situation was observed in other sub-Saharan African countries such as Gabon, Gambia, Kenya, Madagascar, Mali, Mozambique, Uganda and Tanzania.

Box 1: Slum population in selected countries

In some countries such as Angola, the Central African Republic, Chad, Ethiopia, Guinea-Bissau, Madagascar, Niger and the Sudan the slum prevalence had reached an astonishing level of 80 per cent or more, and the number of urban residents living in slum conditions continues to grow in some of these countries. This phenomenon, combined with the inequitable distribution of resources and anti-poor policies has led to rising urban poverty, impeding the sustainability of cities and impacting their economic viability. On many parts of the continent, high rates of urban population growth, combined with the prevalence of unskilled labour and the HIV/Aids epidemic are further undermining poverty reduction efforts in cities.

UN-HABITAT, State of the World's Cities Report, Harmonious Cities, 2008.

J. ASIA, MAKING GOOD PROGRESS ON THE SLUM TARGET IN VARIOUS COUNTRIES

In many Asian countries, urbanization has taken place in a context of economic growth and rapid industrialization. There is no doubt that in this region urbanization has been beneficial both for development and for poverty alleviation. Asian countries, particularly China and India, have been able to lift millions of people out of poverty. However, urban poverty still remains a persistent challenge.

Southern Asia and South-eastern Asia recorded important improvements in the lives of slum dwellers. Since the use of pit latrines in these sub-regions is quite low in most countries (for instance, 5 per cent in Pakistan, around 15 per cent in India and Nepal and 23 per cent in Bangladesh), improvements in the quality of life of slum residents is largely due to successful policies and actions, and not to the change in the definition of adequate sanitation. While Southern Asia experienced an impressive reduction in the proportion of the slum population from 64 per cent in 1990 to 43 per cent in 2005, South-eastern Asia reduced the proportion of slum population from 37 to 28 per cent in the same period. It is likely that in absolute terms the number of slum residents will continue to grow in Southern Asia and will stabilize or reduce in South-eastern Asia. This is due to the fact that in the former sub-region slum and urban growth rates are quite similar (2.2 per cent and 2.9 per cent, respectively); whereas, in the latter sub-

region, slum growth rates are three times lower than urban growth rates (1.3 per cent and 3.8 per cent, respectively) (UN-HABITAT, 2008).

In Eastern Asia, some progress towards the achievement of the slum target was recorded from 1990 to 2001 with the reduction in the proportion of slum dwellers from 41 to 36 per cent; yet, in absolute numbers, slum residents increased by 41 million despite the fact that slum growth rates were significantly lower than urban growth rates (2.3 per cent and 3.4 per cent, respectively). These gains in the reduction of slum incidence were reversed in the following five years with a slight increase in the proportion of slum dwellers by 1 per cent (UN-HABITAT, 2008).

Western Asia made little progress in the slum target by reducing by only 2 percentage points the proportion of slum dwellers from 26 per cent in 1990 and 2001 to 24 per cent in 2005. With annual slum growth rates that are almost the same as urban growth rates, reaching nearly 3 per cent, it is expected that the number of slum residents will not decrease unless more effective policies are put in place to reverse this situation.

Looking beyond the sub-regional averages, the situation at the country level is quite contrasted. Countries like Lebanon, Cambodia, Lao People's Democratic Republic and Myanmar observed increases in the proportion of the slum population of 3, 7, 13 and 15 per cent, respectively, from 1990 to 2005. The quality of life for urban dwellers in countries such as Iraq, Jordan, Saudi Arabia, Syria and Yemen is not really improving, with the proportion of the slum population remaining largely unchanged in the past 15 years. In contrast, significant progress in the reduction of their slum population was recorded for Nepal and Pakistan by more than one-third, India and Iran by 26 and 21 per cent, respectively, and Bangladesh, China, Mongolia and the Philippines by more than 10 per cent.

K. LATIN AMERICA AND THE CARIBBEAN: MIXED RESULTS FOR SLUMS AND POVERTY REDUCTION

Latin America and the Caribbean is the most urbanized region in the developing world with 77 per cent of its population now living in cities. Even the most optimistic view points recognize that economic performance in this region has been rather limited. Most countries are going through ups and downs; a general trend is that of little or no economic growth with a lower per capita GDP in 2002 than the level recorded in 1997 (López-Moreno, 2003). Despite the fact that urban poverty levels have not significantly reduced in the last 10 years and income inequality has not improved in most countries, the proportion of slum dwellers reduced from 35 per cent of the urban population in 1990 to 27 per cent in 2005.

Today, urban growth is significantly higher than slum growth (2.2 per cent and 1.3 per cent, respectively) and this is due to the adoption of more progressive policies promoting inclusive governance in various countries that increased access to basic services, particularly water and sanitation, since the early 1990s (UN-HABITAT, 2006). The changes in the definition of adequate sanitation also affected various countries where the use of pit latrines is prevalent, including Nicaragua, where nearly half of the urban population uses this type of sanitation facilities and, Bolivia, Guatemala and Haiti, with around one-fifth of the population using traditional pit latrines.²⁰ Therefore, the reduction in slum incidence in the region (8 per cent in the period 1990 to 2005) should be viewed with some caution.

²⁰ UN-HABITAT, Global Urban Observatory, 2008. These estimates were produced using DHS data of various years.

Also, it should be noted that, in general, income inequalities have not decreased in the region; not even in those countries that are experiencing high economic growth rates, such as Brazil and Mexico, where urban inequality remain a persistent problem. The Gini index, that measures income/consumption inequalities, has remained unchanged from the early 1990s until 2005 at around 0.55 (UN-HABITAT, 2008) in the region, that maintains a deep and lasting division between rich and poor.

Nevertheless, a certain number of countries are performing well in reducing slums and preventing the formation of new informal settlements. These countries are implementing pro-poor policies with targeted investments either as part of larger responses of urban poverty reduction, or as stand-alone interventions in slum areas. Among these countries, the Dominican Republic recorded the best achievement with more than a one-third reduction in the share of the slum population, followed by Paraguay and Peru, where the proportion of slum dwellers declined by one fifth. Important reductions in slum prevalence were also observed in Brazil, Panama, Trinidad and Tobago and Venezuela ranging between 8 and 16 per cent from 1990 to 2005. Unfortunately, other countries have experienced setbacks in their efforts to improve the living conditions of the slum population: Chile and Honduras experienced an increase in slum prevalence from 4 to 9 per cent and from 24 to 35 per cent, respectively. Jamaica is among the few countries that observed a significant increase in its slum population, which doubled during this period. Various other countries in the Caribbean sub-region had the same share of slum dwellers from 1990 to 2005: French Guiana, Grenada, Guadalupe, Guyana, Jamaica, Martinique and Saint Lucia.

L. NOT ALL SLUM DWELLERS SUFFER THE SAME LEVEL OF DEPRIVATION

At present, one out of three urban residents in the developing world are slum dwellers. New empirical information shows that not all of them suffer the same degree or magnitude of deprivation. Some slums provide better living conditions than others.

The degree of deprivation depends on how many of the five shelter deprivations used to measure slums—lack of access to improved water, lack of access to sanitation, non-durable housing, insufficient living area, and security of tenure—are associated with a particular slum household.

Based on the number of deprivations, UN-HABITAT has grouped slum dwellers into three categories:

- i) *Moderately deprived*, which corresponds to those households living with one shelter deprivation. This could be, for instance, lack of access to improved water or sanitation; it could also be that the household lives in non-durable housing structures or with insufficient living space.
- ii) *Severely deprived*, which are households living with two shelter deprivations that can be a combination of different possibilities; for example, lack of sanitation and insufficient living space, or lack of durable housing structures and lack of improved water; etc.
- iii) *Extremely deprived*, which are households living with three or more shelter deprivations. There are of course different possibilities as combinations of the four slum indicators allow. For example, a household can lack improved water and sanitation and live in a house that is not deemed to be durable as per national standards.

Table 2 shows that the highest intensity of deprivation is found in sub-Saharan Africa where nearly half the slum dwellers live with two or more shelter deprivations.²¹ Southern Asia follows with slightly less than one-third of urban slum dwellers living under severe or extremely severe conditions.²² Levels of deprivation are relatively high in Latin America and the Caribbean and the sub-regions of South-eastern and Western Asia, where one-fourth of slum residents live with two or more shelter deprivations. In contrast, 88 per cent of slum dwellers from North Africa suffer from only one shelter deprivation and 11 per cent from two or more.

TABLE 2. PROPORTION OF URBAN POPULATION LIVING IN SLUMS, 2005

Major area, region, country or area	Urban population (thousands) 2005 a	Slum population (thousands) 2005 b	Percentage of Urban Population living in Slum 2005 c	Percentage of urban household with one shelter deprivation d	Percentage of urban household with two or more shelter deprivations e
Developing world	2,219,811	810,441	36.5	N/A	N/A
Northern Africa	82,809	12,003	14.5	12.8	1.7
Sub-Saharan Africa	264,355	164,531	62.2	31.5	30.8
Latin America and the Caribbean	434,432	117,439	27.0	21.1	5.9
Eastern Asia	593,301	216,436	36.5	N/A	N/A
Southern Asia	468,668	201,185	42.9	30.9	12.0
South-eastern Asia	243,724	67,074	27.5	21.0	6.6
Western Asia	130,368	31,254	24.0	18.7	5.3
Oceania	2,153	519	24.1	N/A	N/A
<p>N/A: Not available</p> <p>a: United Nations Population Division, World Urbanization Prospects: The 2005 Revision</p> <p>b: Population living in household that lack either improved water, improved sanitation, sufficient living area (more than three persons per room), or durable housing</p> <p>c: In the 2005 slum estimation, half of pit latrines are considered improved sanitation. while in the 1990 and 2001 slum estimation all pit latrines were considered not improved</p> <p>Therefore, the 2005 slum figures are not directly comparable to 1990 and 2001 figures</p> <p>d: Population living in household that lack only one shelter basic service</p> <p>e: Population living in household that lack at least two shelter basic services</p>					

There are various countries with slum populations living in extremely severe conditions. According to data from Demographic and Health Surveys and UNICEF's Multiple Indicators Cluster Surveys, 11 countries in sub-Saharan Africa have more than 20 per cent of their slum populations experiencing three or more shelter deprivations. Extreme cases are the Central African Republic, Chad and the Sudan that have more than one third of the urban slum residents with three or more shelter deprivations. Other countries such as Angola, the Democratic Republic

²¹ 30 per cent of the urban population (column 'e') lives with 2 or more shelter deprivations, representing half of the proportion of slum dwellers in the sub-region (62.2 per cent—column 'a').

²² 12 per cent of the slum household live with 2 or more shelter deprivations that represent nearly one third of the total proportion of slum households.

of the Congo, Ethiopia, Guinea-Bissau, Madagascar, Mozambique, Niger and Rwanda, have more than one-fifth of the slum population living in extremely severe deprivation.

In Latin America and the Caribbean, three countries have relatively high prevalence of slum dwellers living in very precarious conditions with three or more shelter deprivations (between 5 and 7 per cent of the slum population): Bolivia, Guatemala and Haiti. Nicaragua exhibits the highest prevalence of slum population with three or more shelter deprivations in the entire region with slightly more than one-tenth of the country's slum population living in extremely severe conditions.

In Asia, the highest level of deprivation among slum dwellers is found in Mongolia, where more than 35 per cent of the poor informal settlers live in extremely severe conditions. In another two countries, Bangladesh and Lao People's Democratic Republic, up to 15 per cent of the country's slum population lives with three or more shelter deprivations. However, this information should be taken with some caution since data disaggregated by level of deprivation are very scant in the region (various other countries with high prevalence of slum dwellers have not yet made information on shelter deficiencies available).

In the *State of the World's Cities 2006/7* report, UN-HABITAT showed a new urban reality where slum dwellers die earlier, experience more hunger, have less education, have fewer chances of employment in the formal sector and suffer from more ill-health than the rest of the urban population.

UN-HABITAT presented for the first time, data disaggregated by urban, rural, slum and non-slum levels in various cities across the developing world. The results were quite striking: urban poverty appeared to be a severe, pervasive and largely unacknowledged feature of urban life. Indeed, for many social and health indicators, such as incidence of disease and mortality, the figures were much higher in slums than in non-slum areas. In many cases, the figures for slum and rural areas were similar.

Moreover, UN-HABITAT studies revealed that urban poverty could be as dehumanizing and intense as rural poverty. Various Millennium Development Goals indicators showed remarkable similarities between slum and rural areas. For instance, in low-income countries such as Bangladesh, Ethiopia, Haiti, India, Nepal and Niger—countries where poverty is seen as primarily a rural phenomenon—4 out of every 10 slum children are malnourished, a rate that is comparable to that found in the rural areas of these countries. Likewise, in some cities such as Khartoum and Nairobi, the prevalence of diarrhoea is much higher among slum children than among rural children. In slums, child deaths are attributed not so much to lack of immunization against measles, but inadequate living conditions, such as lack of access to safe water and sanitation or indoor air pollution, which lead to water-borne and respiratory illnesses among children (UN-HABITAT, 2006).

Further studies show with compelling statistical evidence that a slum resident in the city of Cairo can be better off than a non-slum dweller in Lagos, Luanda and many other cities in sub-Saharan Africa in terms of indicators such as health, education or environmental conditions. It also shows that an ordinary slum dweller in Turkey suffers mostly from overcrowding similar to a Colombian or Zimbabwean slum resident, whereas an Egyptian or Mexican slum resident suffers mainly from lack of improved sanitation. When slum households live in severely deprived conditions, they can suffer from lack of sanitation and durable housing (Indonesia), or lack of improved water and overcrowding (Viet Nam), or lack of sanitation and sufficient living space (Bolivia and Haiti), these are just a few examples to illustrate the fact that not all slum dwellers

around the world suffer the same fate: some are worse off than others. By disaggregating the type and level of shelter deprivation in slums (i.e. severe or non-severe), policymakers are in a better position to devise policy responses that are better focused and targeted. Moreover, by showing that one in five households with extremely severe shelter deprivations are headed by women, and in the cities of Central Asia, women-headed households are almost the norm, rather than the exception, it is possible to develop better-informed policies, programmes and urban planning measures to improve living conditions of slum households by targeting women (UN-HABITAT, 2008).

By studying the prevalence of slum households by levels of deprivation, it is possible to observe that a slum household that suffers from a disease such as diarrhoea can be one or two times more at risk when it is extremely deprived than when it is affected only by one shelter deprivation. For example, in the city of Ouagadougou, the capital of Burkina Faso, the proportion of children with diarrhoea in slum areas is 20 per cent, whereas, those children living with three shelter deprivations are two times more exposed (37 per cent) and those with four shelter deprivations are 2.5 times more at risk. Likewise in the city of Harare, the capital of Zimbabwe, children in slum household suffering from two shelter deprivations are five times more exposed to diarrhoea than children in slum households with only one shelter deprivation (UN-HABITAT, 2008).

A similar pattern is observed in various other indicators. For instance, previous studies have found that a high prevalence of child malnutrition is strongly correlated to high levels of slum incidence. In other words, countries such as Bangladesh, Ethiopia, Haiti, India, Nepal and Niger, all of which have high incidence of slums, are also those with the highest incidence of malnourished children.²³ Also, new data associating shelter deprivations to under-weight children shows that in severely deprived slum households it is possible to find up to two times more children under-weight than in moderately deprived slum households. This is the case, for instance, in Cotonou, Benin; Nairobi, Kenya; Windhoek, Namibia; Ibadan, Nigeria; Kigali, Rwanda; Dakar, Senegal and Lusaka, Zambia.²⁴ The greatest difference exists in Abuja, Nigeria and Maputo, Mozambique where child malnutrition is 5 and 7 times higher, respectively, in slum households living with three shelter deficiencies than in slum households with only one shelter deficiency.

Available data show that poor neighbourhoods do not only tend to struggle with localized and health-threatening environmental issues due to lack of safe water, inadequate sanitation and poor waste management, but they also have problems in accessing schools and decent jobs. Studies indicate very clearly that in most cities where data is available, children living in slum areas have lower enrolment rates in primary education than children living in non-slum areas. However, new data produced by UN-HABITAT shows that social inequality levels are further exacerbated when the analysis takes into account the intensity of deprivation experienced by slum dwellers. In the cities of Lagos, Nigeria; Kigali, Rwanda; Freetown, Sierra Leone; and Dar es Salaam, Tanzania, enrolment rates in primary education for males in different years from 1998 to 2004 were between 20 to 30 percentage points lower in slum areas with three or more shelter deprivations than in slum areas with only one shelter deprivation. In Lusaka, Zambia, in 2002, the difference in school enrolment rates between severely deprived slums and moderately deprived slums was as high as 40 percentage points, and in Niamey, Niger, it reached 57 per cent

²³ Mboup Gora, "Hunger: The Invisible Crises in Cities", State of the World's cities Report , UN-HABITAT, 2006.

²⁴ Data on percentage of children under-weight by Shelter deprivation, various years from 2001 to 2003, Global Urban Observatory, UN-HABITAT.

difference in 1998. The differences for female students were more or less similar (UN-HABITAT, 2008).

New techniques can help to identify slums and associate them with specific geographic locations. This information can be combined with other urban and slum indicators that can help to understand the spatial components of the levels of deprivation and the dynamics of city growth and slum formation in order to make more informed decisions to improve the lives of slum dwellers and build cities that are more harmonious.

M. FROM DENIAL TO POSITIVE RESPONSES: FIVE INGREDIENTS OF SUCCESS

Progress on the slum target of 2020 will depend on how governments address slums as part of a broader agenda for reducing urban poverty and inequality in cities. National governments and local authorities need to respond both to existing and new potential slum dwellers (around 400 additional million from now to 2020). This combined response is a key target in its own right that has the potential to influence the achievement of other MDGs. Countries that are performing well need to sustain actions and scale up efforts to improve the lives of existing slum residents, while providing adequate alternatives to new slum formation. Countries that are falling short on the slum target require a decisive breakthrough in their attitudes and policies vis-à-vis slums and urban poverty in general.

The focus of global policy needs to be on countries and regions facing the highest development challenges in slum reduction, that is, sub-Saharan Africa and Southern Asia. It should also be focused on those countries that may be meeting the slum target at the national level but are experiencing huge spatial inequalities in some regions and cities. Finally, it also needs to be focused on cities that are doing relatively well, but have large pockets of poverty within their urban areas. If this is not done, it is likely that the failure to achieve the slum target will jeopardize the achievement of other MDGs.

Some national and local governments, particularly during the last decade, did not take action to address the problems of their rapidly growing slums or confined their actions to symbolic gestures, and often continued with practices of slum clearance and mass evictions.

In many other countries and cities, institutional responses are permeated by a lacklustre tone of quasi-resignation: “the problem is too huge to be tackled”, they argue. Other government responses seem to lie somewhere between action and inaction. They are aware of the slum problem; they are trying to pursue institutional strengthening and some level of reforms, but implementing actions is difficult because of insufficient political support and funding, or because they lack coordination.²⁵

Governments in countries that are performing well are making commitments backed by bold policy reforms; adopting planning measures and equitable economic policies to prevent future slum growth.

Specific policy evidence drawn from the experience of 23 countries analyzed by UN-HABITAT in 2005-2006 and another 21 country surveys conducted by UN-HABITAT in

²⁵ Garau Pietro, “Draft notes for the State of the World’s Cities Report 2008: Policy Analysis and Recommendations,” paper prepared for UN-HABITAT, March 2008.

collaboration with Cities Alliances in 2007 show that countries performing well share many attributes that can be summarized into five ingredients of success: 1) awareness and advocacy; 2) long-term political commitment; 3) policy reforms and institutional strengthening; 4) implementation and monitoring; 5) scaling up actions.²⁶

1. Awareness and advocacy

Local authorities and their partners know and understand key issues related to slum upgrading and prevention. Examples of this include establishing monitoring systems and indicators to collect information and to analyze trends (Thailand, Brazil, Indonesia). Developing communication strategies to disseminate messages regarding how to improve the living conditions of slum dwellers can also be included (Brazil, Mexico).

With regard to advocacy by the non-governmental sector, there are examples of civil society organizations championing the positions and rights of slum dwellers and of the poor in general. Some of them act as watchdogs (*Réseau Social Watch Bénin*) that set themselves the task of monitoring the fulfillment of the Millennium Development Goals and the National Poverty Reduction Strategy Paper. Sometimes, civil society and governments' interactions become the legislative norm or an important component of government-funded programmes (Mexico *Hábitat y Rescate de Espacios Públicos (Reappropriation of public space)*).²⁷ Sometimes, civil society organizations, such as Shack/Slum Dwellers International, perform both an advocacy and an executing role. In all these cases, awareness and advocacy contributed to raising political commitment.

2. Long-term political commitment

Some countries demonstrated consistent political commitment over the years for large-scale slum upgrading and service provision for the urban poor (Chowdhury, 2006). These countries have been most successful in reducing or stabilizing slum growth rates in the last 15 years (Brazil, Egypt, Mexico, South Africa, Thailand and Tunisia). Other countries, while often showing considerable political determination, performed less well due to the political upheavals of the last two decades that have somewhat undermined slum improvement efforts (Indonesia and the Philippines). A certain number of countries showed more modest support for upgrading, having fairly recently stepped up actions to tackle slum growth (Ghana, Morocco). In many other countries, political support was more moderate, translating into sporadic actions implemented over the last 15 years in a non-systematic manner, which appeared to have held back governments' performance in achieving the kind of turnaround in slum numbers that was seen in countries where political commitment was consistently stronger (Tanzania, Argentina, Lebanon).

Finally, some countries have shown signs of recent commitment to change by developing political support for slum upgrading and prevention that includes reforms in policies governing land and tenure (Burkina Faso, Senegal, Tanzania). Another indication of strong political commitment for slum improvement is the inclusion of upgrading and urban poverty reduction policies in the national development agenda (Jordan, Cameroon). Consistency in political commitment is crucial for mobilizing long-term support for slum upgrading and prevention, and this only works when it is translated into progressive pro-poor reforms and better institutional coordination.

²⁶ Results of these surveys were also published in UN-HABITAT (2008), *State of the World's Cities 2008/9: Harmonious Cities*, London and Sterling, VA: Earthscan.

²⁷ Garau Pietro, *op cit*.

3. Policy reform and institutional strengthening

In order to have an impact, political commitments have to be translated into policy reforms. Political messages only make a difference if they are backed by long-term strategies with realistic national targets for slum improvements, adequate budgetary allocation, and policies to meet the targets. Policy reforms or slum upgrading and prevention include housing policy, land reform, provision of affordable land, infrastructure provision and financial reforms, etc. Some countries have implemented pro-poor policies and instruments to integrate the urban poor into the legal and social fabric of cities (Brazil, Chile, Colombia); others have put forward major pro-poor reforms and programmes in land and housing provision (India) or are adopting more inclusive approaches, i.e. from “housing” to “human settlements”. Some other countries are implementing policies to avoid relocations and instead work on settlements *in situ* by improving living conditions (Costa Rica, Ecuador, Colombia).

Many countries have developed slum upgrading and prevention actions and related policy reforms that go beyond the housing sector within the context of wider urban poverty reduction strategies (Indonesia, Iran, Mexico, Philippines, South Africa, Turkey). Generally, most actions show a shift from policies of entitlement to policies of co-participation, i.e. requirements for financial viability and down payments as a prerequisite for access to government subsidies both for new housing and housing improvements.²⁸ On the institutional front, the creation of a Human Settlements Ministry (Burkina Faso) is seen as a positive development giving more visibility and continuity to the cause. There are also visible tendencies to decentralize at the municipal level, by creating community-based consultation mechanisms that take different names in different contexts, such as community development committees in such diverse settings as Cambodia, Malawi and Zambia.

4. Implementation and monitoring

Countries that performed well on the slum target were successful in operationalizing policy reforms in an effective, transparent and pro-poor manner. They devoted human and technical resources as well as capacities of the various implementing institutions (Thailand, South Korea). Various other successful countries trained personnel in the many areas of urban planning and management—surveyors, architects, planners, engineers, accountants, managers—and employed them in housing and basic service delivery programmes (Colombia, Chile, Philippines, South Africa). However, the most successful countries implemented actions through a coordinated response involving the central government, regional and local authorities and the private sector (Egypt, Tunisia, Chile, Sri Lanka, Thailand).

Few countries defined national targets. The exceptions are Cambodia, where the government committed to upgrading 100 slum communities per year; Chile, Brazil and Thailand, among others, that set clear slum targets and benchmarks for urban poverty reduction.

Cities and countries that were successful in the delivery of basic services and housing improvements implemented clear performance monitoring mechanisms either in a bottom-up or a top-down manner. In China, Viet Nam and Cambodia, upward accountability on municipal implementation on infrastructure is strict. In these cases, the central government is the authority that exercises performance monitoring, which, in general, is not the case with most municipalities of the developing world. Bottom-up performance monitoring on the other hand enhances citizen participation in planning and decision-making (Brazil). This system also embraces the results-

²⁸ Garau Pietro, *op cit.*

based monitoring implemented indirectly by client satisfactory indicators collected through surveys (Indonesia) (Bazoglu, 2008).

5. Scaling up actions

Countries such as Brazil, Mexico, Colombia, South Africa, Thailand and Tunisia have all managed to successfully scale-up programmes for slum and informal settlements upgrading and urban poverty reduction to countrywide levels. In doing so, these programmes have resulted in a measurable impact on national indicators of slum growth (Chowdhury, 2006). One-off local projects, however successful, are usually incapable of making such a mark without widespread replication and scaling up. Pilot projects provide valuable test cases and, when they work, demonstrate the technical and financial feasibility of providing better housing and services to the urban poor.

Many of today's successful national slum upgrading projects, such as Indonesia's Kampong Improvement Programme, began on a modest scale covering a few neighbourhoods or a single city, and with a proven track record, were expanded to the national level. Equally important, these countries have realized that the magnitude of deficiencies in basic infrastructure, service and shelter provision for slum communities today will fade into insignificance compared to conditions in the next 5, 10 or 15 years.

Success in some countries was translated into programmes and actions that involved additional partners, such as the private sector and civil society in the same locality, or in another or several localities. In other cases, scaling up included additional funding for similar actions and the institutionalization or internalization of the programmes into government structures to continue delivering beyond the first or pilot phase (Brazil, Egypt, Mexico, Thailand, Tunisia).

In some countries, reforms started in the 1980s in the capital city and were further developed by the central government as a mechanism to undertake large-scale physical and tenure upgrading of irregular settlements (Burkina Faso, Senegal). Other countries experimented with large-scale government subsidies in the housing sector in an attempt to reach the poorest segments of the population and to meet the rising costs of social housing (Chile, South Africa).

In most cases, success was driven by a strong mobilization of domestic resources and the use of external financial support to promote innovation and to develop and implement strategic pilot activities. The use of resources followed a two-pronged strategy: 1) scaling up improvements in existing slums, and 2) planning well ahead to provide better alternative solutions to avoid the spread of future slums.

Policy analysis of country and city responses to the surveys reveals that performance on the slum target is a combination of the above five ingredients of success, and, quite often, the result of centralized interventions that are further implemented and coordinated by local authorities. This is possible because central governments—having command and control—could put in place measures and resources to ensure cohesiveness in the design and implementation of slum upgrading projects.

This perhaps is a prelude to a paradigm shift in the national structures of governance where central governments and local authorities would develop a more coordinated approach in the development and implementation of policies. On the one hand, central governments would play an even more critical role in improving the lives of the urban poor, partly because they would have the power and authority to institute pro-poor reforms and the mandate and ability to

allocate resources to various priority sectors. On the other hand, local authorities would be able to coordinate operational actions bringing together different actors.

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Part Two
Internal migration, population distribution
and development

SPATIAL DISTRIBUTION OF THE POPULATION, INTERNAL MIGRATION AND DEVELOPMENT IN LATIN AMERICA AND THE CARIBBEAN

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A. INTRODUCTION

The countries in Latin America and the Caribbean have undergone significant transformations in the last 30 years. Many of the changes relate to the territorial distribution and mobility of the population. This chapter describes those changes and links them with the socio-economic, political and cultural changes in the region.

The document discusses certain hypotheses that are common in the literature (ECLAC, 2007), and provides evidence to assess the validity of each hypothesis. The first three hypotheses concern the spatial distribution of the population, while the last six deal with internal migration:

1. Urbanization in the region is not a statistical artefact, but it is linked only indirectly to the process of economic and social development.
2. Changes in the development model that have taken place since the 1980s reinforce the value of rural areas over cities. This could have lead to rural areas becoming more attractive.
3. Various “deconcentration” forces have made large cities demographically less dynamic than medium-sized cities. As a result, the region’s urban system should be diversifying and becoming less polarized.
4. The process of economic and social development stimulates all forms of migration.
5. Internal migration has an increasingly complex relationship with development at the sub-national level. Although flows can still be predicted on the basis of sub-national differences in development indicators, there are several exceptions that affect the strength of that relationship.
6. Given the predominant direction of migratory flows and the selectivity of migrants in terms of age and level of schooling, migration is unlikely to help reduce regional inequalities;
7. For the reasons given above, migration is likely to contribute to the creation of “poverty traps” in areas that have traditionally been socio-economically disadvantaged;
8. Rural-to-urban migration continues to reduce population growth in the countryside, while its role in the growth of cities is declining.
9. The region’s large cities register net emigration, and a majority of those leaving do not move to the areas surrounding these cities but to more distant areas. Thus net emigration does not lead to a “concentrated deconcentration.”¹

Following a review of these hypotheses, the chapter concludes by outlining the policy implications of the findings.

B. SPATIAL DISTRIBUTION OF THE POPULATION AND DEVELOPMENT IN LATIN AMERICA: HYPOTHESES AND EVIDENCE

1. *Is Latin America's urbanization real?*

Latin America and the Caribbean is the world's most urbanized region of the developing world, with a proportion urban of 77.4 per cent in 2005, which is only surpassed by North America (80.7 per cent) and is higher than that of Europe (72.2 per cent) (United Nations, 2006).

Expressions such as over-urbanization and hyper-urbanization have been used to describe the region's high level of urbanization without the level of economic and social development typical of industrialized countries (Rodríguez and Martine, 2008). Nonetheless, in purely demographic terms, the high levels of urbanization in Latin American and the Caribbean are not a "statistical fiction" resulting from the lack of an official uniform definition of "urban" in the region. The data from *Distribución Espacial de la Población y Urbanización en América Latina y el Caribe* (DEPUALC) (www.eclac.cl/celade/depualc), which allows for the unambiguous identification of urban agglomerations and minimizes problems of consistency in comparisons, attests to this (Montgomery and others, 2004).

The region has a much higher proportion of the total population living in cities of 500,000 or more inhabitants than Europe (table 1). Also, calculations for a group of nine countries in the region with data from the 2000 round of censuses² indicate that 65 per cent of the region's total population and 81.5 per cent of the urban population were living in cities of 20,000 or more inhabitants (CELADE - Population Division of ECLAC, 2007).

TABLE 1. POPULATION LIVING IN CITIES OF 500,000 HABITATS AND OVER (IN THOUSANDS) AND PERCENTAGE OF THE TOTAL POPULATION LIVING IN SUCH CITIES BY REGION, 2005

Region	10 million or more	5 to 10 million	1 to 5 million	500,000 to 1 million	Percentage of total population in cities with 500,000 inhabitants or more
Latin America and the Caribbean	61 764	25 919	95 236	42 067	40.1
Africa.....	22 014	6 049	82 110	35 226	16.0
Asia.....	167 145	118 329	356 191	159 886	20.5
Europe.....	10 654	29 244	79 464	53 243	23.7
Oceania	0	0	13 472	517	42.4
North America	31 016	24 951	86 729	27 265	51.3

Source: prepared by the author, on the basis of United Nations, *World Urbanization Prospects. The 2005 Revision Executive Summary. Fact Sheets. Data Tables* (ESA/P/WP/200), New York, 2006, available from www.un.org/esa/population/publications/WUP2005/2005WUPHighlights_Final_Report.pdf, table 2 and A.17. (Accessed on 27 November 2007).

But there is considerable heterogeneity among countries behind these regional figures. The diversity follows a relatively familiar pattern: countries with a higher level of human development (Argentina, Chile and Uruguay) tend to have higher proportions of population living in cities.³ One exception is Costa Rica, which has a lower percentage of population living in cities than would be expected given its high human development index (table 2).

TABLE 2. HUMAN DEVELOPMENT INDEX (HDI) IN SELECTED LATIN AMERICAN COUNTRIES IN 2000 AND PERCENTAGE OF THE POPULATION LIVING IN CITIES OF 20,000 INHABITANTS OR MORE, BY COUNTRY AND CENSUS ROUND

Country (HDI, 2000)	Census round					
	1950	1960	1970	1980	1990	2000
Argentina (0.860)	50.8	60.1	66.9	71.0	74.9	76.5
Bolivia (0.675)	19.7	...	34.1	...	49.6	54.1
Brazil (0.785)	28.8	28.9	40.7	52.2	58.4	64.5
Chile (0.843)	47.1	55.1	62.0	68.5	72.1	75.4
Colombia (0.775)	22.5	37.2	45.5	55.1	59.2	60.2
Costa Rica (0.832)	18.4	22.8	30.8	33.8	33.8	49.2
Cuba (0.826: 2004)	38.3	...	43.8	47.9	47.9	...
Ecuador (0.732: 1995)	18.0	27.7	35.3	42.5	48.0	54.7
El Salvador (0.715)	14.7	19.5	21.9	...	35.9	...
Guatemala (0.656)	14.5	19.2	22.2	22.6	24.3	32.5
Haiti (0.451: 1995)	5.5	...	13.7	17.4	17.4	...
Honduras (0.654)	6.8	11.5	20.5	28.0	28.0	34.7
Mexico (0.811)	29.3	36.9	45.7	52.8	57.1	60.7
Nicaragua (0.667)	15.2	23.0	29.6	...	41.0	...
Panama (0.797)	28.2	34.6	39.1	43.6	46.8	52.7
Paraguay (0.754)	19.6	23.0	27.6	33.1	39.0	44.6
Peru (0.760)	15.9	30.3	42.0	49.9	55.2	...
Dominican Republic (0.733)	11.1	18.7	30.5	41.9	45.2	52.7
Uruguay (0.841)	66.9	66.9	69.9	71.8	74.3	...
Venezuela (0.774)	38.7	52.7	63.5	70.5	71.5	74.3

Source: Latin American and Caribbean Demographic Centre (CELADE)-Population Division of ECLAC, on the basis of the online database on spatial distribution and urbanization in Latin America and the Caribbean (DEPUALC), available from www.eclac.cl/ceclade/depualc/ and United Nations Development Programme (UNDP) available from <http://hdrstats.undp.org/indicators/10.html>. (Accessed on 14 November 2007).

2. *Change in the development model: a demographic boost for the countryside?*

Up to the 1980s, the prevailing development strategy in countries of Latin America and the Caribbean was known as Import-Substitution Industrialization (ISI). This strategy contributed to a pro-urban bias, as it was geared towards promoting industry and gave a very significant role to the State (ECLAC, 2005a). When the development strategy changed to one that was more open to the world economy, greater exploitation of natural resources and more influenced by market forces, there were predictions of strong productive buoyancy in rural areas, which might in turn have recovered their labour retention capacity and possibly even become poles of attraction for the first time in centuries (Guzmán and others., 2006; Rodríguez, 2002).

Two main trends lead to the conclusion that the new development model has not led to a recovery of the demographic dynamism in the countryside. The first relates to the process of urbanization, which has continued to unfold, albeit at a decreasing speed. While the proportion urban continues to increase, the rate of urbanization, or the average rate of increase of the percentage urban, has fallen as the region approaches a proportion urban of 100 per cent (table 3). In addition, the rural population has been shrinking in absolute terms since 1990. Given that the rural population has a positive natural increase, this implies that there is substantial net rural emigration. Thus, the new development model has not increased the rate of population growth in rural areas.

TABLE 3. TOTAL, RURAL AND URBAN POPULATION AND SELECTED INDICATORS OF URBANIZATION IN LATIN AMERICA AND THE CARIBBEAN

Year	1950	1960	1970	1980	1990	2000	2010	2020	2030
Total	167 321	218 577	285 196	362 210	443 747	522 929	598 771	666 955	722 377
Rural	97 084	111 062	122 178	126 522	129 007	128 717	125 210	120 613	113 409
Urban	70 237	107 515	163 018	235 688	314 739	394 212	473 561	546 342	608 968
Per cent Urban	42.0	49.2	57.2	65.1	70.9	75.4	79.1	81.9	84.3
Urbanization rate	1.58	1.51	1.29	0.85	0.62	0.48	0.35	0.29	
Per cent Rural	58.0	50.8	42.8	34.9	29.1	24.6	20.9	18.1	15.7
Ratio UR-Per cent R	0.029	0.032	0.033	0.027	0.023	0.021	0.018	0.017	

Source: United Nations, Available from <http://esa.un.org/unup/p2k0data.asp> (Accessed on 27 November 2007).

In hindsight, this should come as no surprise, as the region had already lived through agricultural modernization processes that resulted in substantial rural migratory outflows between 1940 and 1980 (Alberts and Villa, 1980). There has been an agricultural revitalization since the mid-1980s, expressed in a slight increase in agricultural value added over total GDP (ECLAC, 2005b), but it has mainly been based on large farms and forestry businesses that tend to be less labour intensive and crowd out traditional farming. Furthermore, the labour demand of these businesses is highly seasonal, and is therefore increasingly met by urban workers from nearby or sometimes even faraway cities (ECLAC, 2005b).

Thus, there are no signs of counter-urbanization in the region and future changes in production patterns are not likely to trigger it. If counter-urbanization were to occur, it would be as in Europe, the result of housing-related forces promoted by technological progress, improved infrastructure and connectivity, and changes in the population structure and individual's purchasing power (Gans, 2007; Ferras, 2007). In other words, any eventual "return to the countryside" would not represent a return to agriculture, but rather a decision to combine the quality of life in peri-urban and rural settings with the employment, educational and leisure opportunities in nearby urban areas. However, it is difficult to conceive of a high quality of life in rural areas, as social indicators there remain below those of urban settings (ECLAC, 2007 and 2005b).

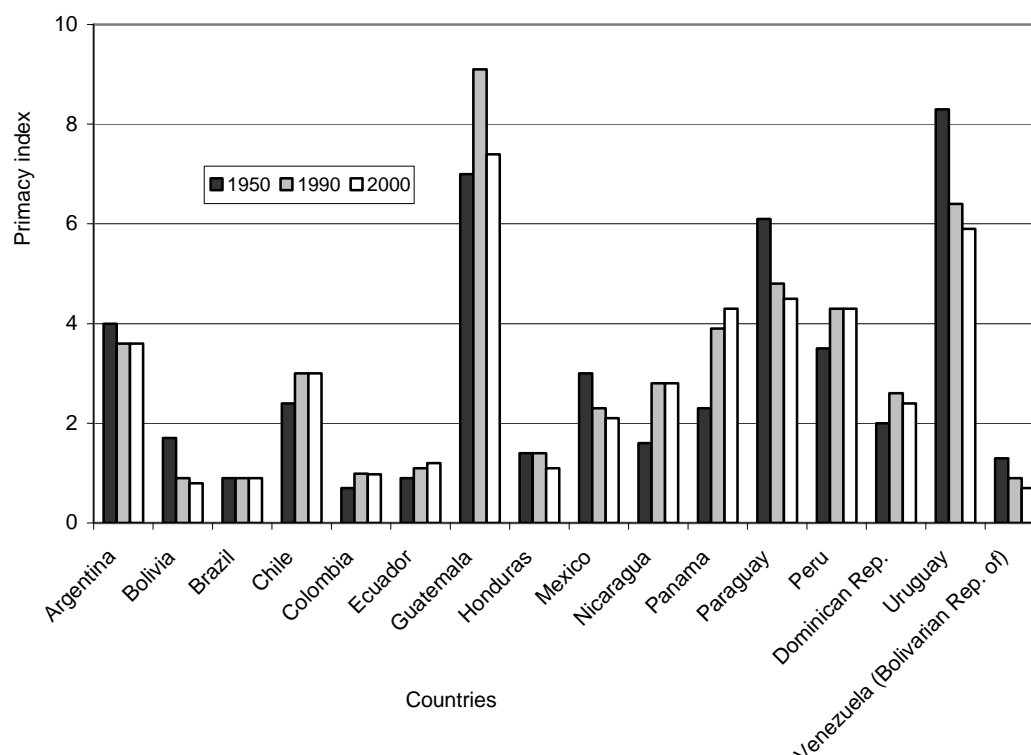
3. Are urban areas becoming less concentrated?

Historically, urbanization in Latin America took place mainly through large cities, which experienced population growth rates considerably higher than those of the total national and the total urban population. The physical expansion of those large cities was generally disorganized (Guzmán and others, 2006). Indeed, up until the 1970s, urbanization and the concentration of the population in the largest city (or in the two largest cities in countries such as Brazil, Ecuador and Honduras) were overlapping phenomena in most of the region. The inward-looking national development strategies and the concentration of investment in the main city were responsible for the fact that urbanization clustered in one or two major cities (Alberts and Villa, 1980). Consequently, changes in the development model generated expectations of deconcentration (Pinto da Cunha, 2002). Several other processes underway since the 1980s, namely decentralisation, industrial relocation, signs of crises in major cities and public policies purposely aimed at deconcentration (ECLAC, 2005a; Dupont and others, 2002).

The available evidence suggests that these factors have had an impact, as population growth in the main city has declined. Although it is not yet clear whether the share of large cities in the total population is declining, they are definitely losing significance as a share of the total population. During

the last intercensal period, the “primacy index”, that is to say, the ratio of the population of the largest city over the population of the next three largest cities combined, increased in just two countries, while it fell in the vast majority of cases, sometimes significantly and at times reversing the historic growth of the main city’s power of attraction (figure 1).

Figure 1. Latin America, selected countries: primacy index circa 1950, 1990 and 2000



Source: Prepared by the author on the basis of the database on spatial distribution and urbanization in Latin America and the Caribbean (DEPUALC), available from www.eclac.cl/celade/depualc/. Accessed 5 January 2008.

Despite this, the traditional pattern of urbanization concentrated in one or two major cities has had permanent effects in the region, including the presence of a considerable number of mega-cities,⁴ the relatively high primacy index in many countries, and the large proportion of the population that lives in cities with over one million inhabitants.

In order to study the regional system of human settlements in more detail, cities have been classified in five categories (see table 4 and figures 2 and 3).⁵ The population in places with fewer than 2,000 inhabitants or dispersed populations were counted as residual. Table 4 shows the number of areas with over 20,000 inhabitants by census period and size category. Urbanization in Latin America and the Caribbean has clearly involved a striking expansion and diversification of the city system: between 1950 and 2000 the region went from 272 to 1,528 cities with more than 20,000 inhabitants. Given the long-term disadvantages associated with top-heavy urban systems, this growing urban network is more conducive to regional development, socially and geographically, than the high primacy systems that prevailed in most of the countries of the region in the past (Davis and Henderson, 2003). Although the number of cities of over a million inhabitants also increased greatly (almost sevenfold between 1950 and 1990), the increase in that number came to a halt in the 1990s. Furthermore, the limited number of cities in the smaller-size category is such that no major increases are expected in the present decade. Medium-sized cities (50,000 to 500,000 inhabitants) and small intermediate cities (20,000 to 50,000 inhabitants)

are the fastest growing categories, which confirms the tendency towards a more robust and complex urban system.

TABLE 4. NUMBER OF TOWNS BY POPULATION SIZE IN SELECTED COUNTRIES OF LATIN AMERICA AND THE CARIBBEAN, CENSUS ROUNDS 1950 TO 2000

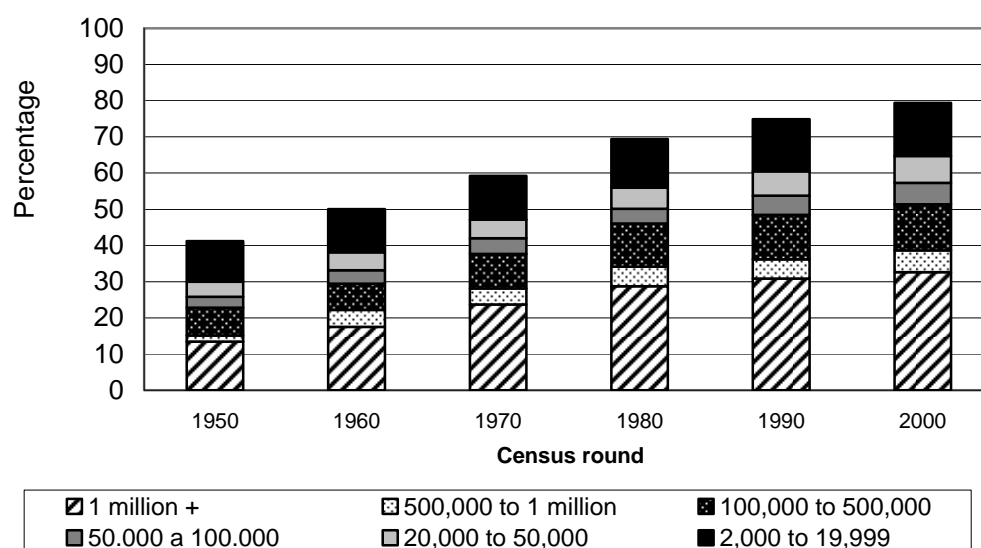
Size category (inhabitants)	1950	1960	1970	1980	1990	2000
1 000 000 and above	5	9	17	23	33	35
500 000 to 1 000 000	4	13	14	20	28	33
100 000 to 500 000	42	64	112	171	202	225
50 000 to 100 000	54	95	135	166	261	314
20 000 to 50 000	167	261	374	540	754	921
Total cities with 20 000 and above	272	442	652	920	1 278	1 528

Source: Prepared by the author database available from www.eclac.cl/celade/depualc/ database on spatial distribution and urbanization in Latin America and the Caribbean (DEPUALC). Accessed 5 January 2008.

NOTE: In this table, "medium-size" cities (between 50 thousand and 500 thousand inhabitants, have been further subdivided in two groups, from 50 thousand to 100 thousand, and from 100 thousand to 500 thousand.

Increasing urbanization has been associated with increases in the proportion of the total population in all the city size categories (figure 2). Cities of more than one million inhabitants more than doubled their share to reach extraordinary proportions: one in three of the region's inhabitants live in such cities. Figure 2 also shows that the population momentum of these cities slowed in the 1990s. The fragmentary evidence from counts and censuses carried out around 2005 suggests that the growth rate has slowed even further during the first half of the 2000s. In contrast, intermediate cities are growing increasingly fast, which ties in with the hypothesis of diversification. Lastly, the percentage of the population in cities of 2,000 to 20,000 inhabitants is also growing. These small cities are more closely connected to the rural areas than to the rest of the urban system.

Figure 2. Latin America and the Caribbean (selected countries): share of towns with 20,000 or more inhabitants in total population, by size category

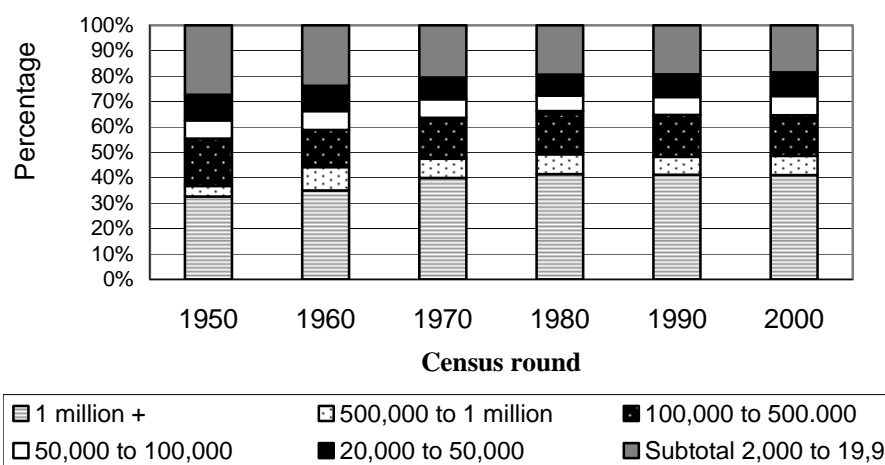


Source: Prepared by the author from the Database on Spatial Distribution and Urbanization in Latin America and the Caribbean (DEPUALC). Available from www.eclac.cl/celade/depualc/. Accessed 8 January 2008.

The distribution of the urban population, that is, the percentage of the urban population in cities of different size, shown in figure 3, has been relatively stable since 1970, as shown in figure 3. The proportion of the urban population in cities of more than one million inhabitants has remained stable at 40 per cent, since 1970. The share of small towns (fewer than 20,000 inhabitants) has declined slightly, from 21 per cent of the urban population in 1970 to 19 per cent in 2000, and the percentage of the urban population in intermediate cities (between 20,000 and 1 million inhabitants) has increased from 38 per cent in 1970 to 41 per cent in 2000.

These trends are the result of the effects of natural increase, net migration or reclassification of areas. Later in this paper we will address this matter in more detail, as it has important policy implications.

Figure 3. Latin America and the Caribbean (selected countries): distribution of the urban population by city size



Source: Prepared by the author from database available from www.eclac.cl/celade/depualc/ database on spatial distribution and urbanization in Latin America and the Caribbean (DEPUALC). Accessed 8 January 2008.

B. INTERNAL MIGRATION AND DEVELOPMENT IN LATIN AMERICA AND THE CARIBBEAN: HYPOTHESES AND EVIDENCE

1. *Is internal migration on the rise?*

Since Ravenstein (1885), a prevailing idea in the literature has been that material progress stimulates migration by promoting the extension of transportation and a reduction in the costs of travel (Aroca, 2004; Greenwood and Hunt, 2003; Cardona and Simmons, 1975).

Although this hypothesis still prevails (Van der Gaag and van Wisen, 2001), the work of Zelinsky (1971) questions the predictability of internal migration, a stance that has been strengthened by new arguments, such as: (a) development tends to reduce disparities between sub-national areas, thereby eroding the main trigger of internal migration; (b) development brings down the costs of mobility in general, which may result in internal migration being replaced by international migration or daily commuting; (c) development raises family income and facilitates homeownership (which is a strong factor in territorial settlement); (d) current development is conducive to the emergence of virtual spaces that inhibit migration by making it possible to “be there without being physically present”; (e)

development is concomitant with urbanization; as the proportion urban grows,, the role of rural-to-urban migration as a component of urbanization loses significance because the stock of potential rural out-migrants declines (van der Gaag and van Wisen, 2001). Given that the long-term trend of migratory intensity is currently the subject of much debate, evidence is required to settle the matter.

Table 5 shows trends in the proportions of migrants according to the type of migration. Although the migration levels are high,⁶ they are considerably lower than, for example, those of the United States. In terms of trends, the region seems to have a fairly stable stock of internal migrants, with some noticeable decline of recent migration. Given that these figures are strongly influenced by Brazil and Mexico, figure 4 shows migration between major administrative units in the past five years for individual countries. These data show a downward trend in the internal mobility rate in most countries.

TABLE 5. PERCENTAGE OF INTERNAL MIGRANTS BY TYPE OF MIGRATION IN LATIN AMERICA AND THE CARIBBEAN, 1990 AND 2000

Census round	Absolute or life-time migration		Recent migration (last 5 years)	
	Major administrative division (per cent)	Minor administrative division (per cent)	Major administrative division (per cent)	Minor administrative division (per cent)
1990	17.5	34.2	5.1	12.6
2000	17.7	35.2	4.0	8.7

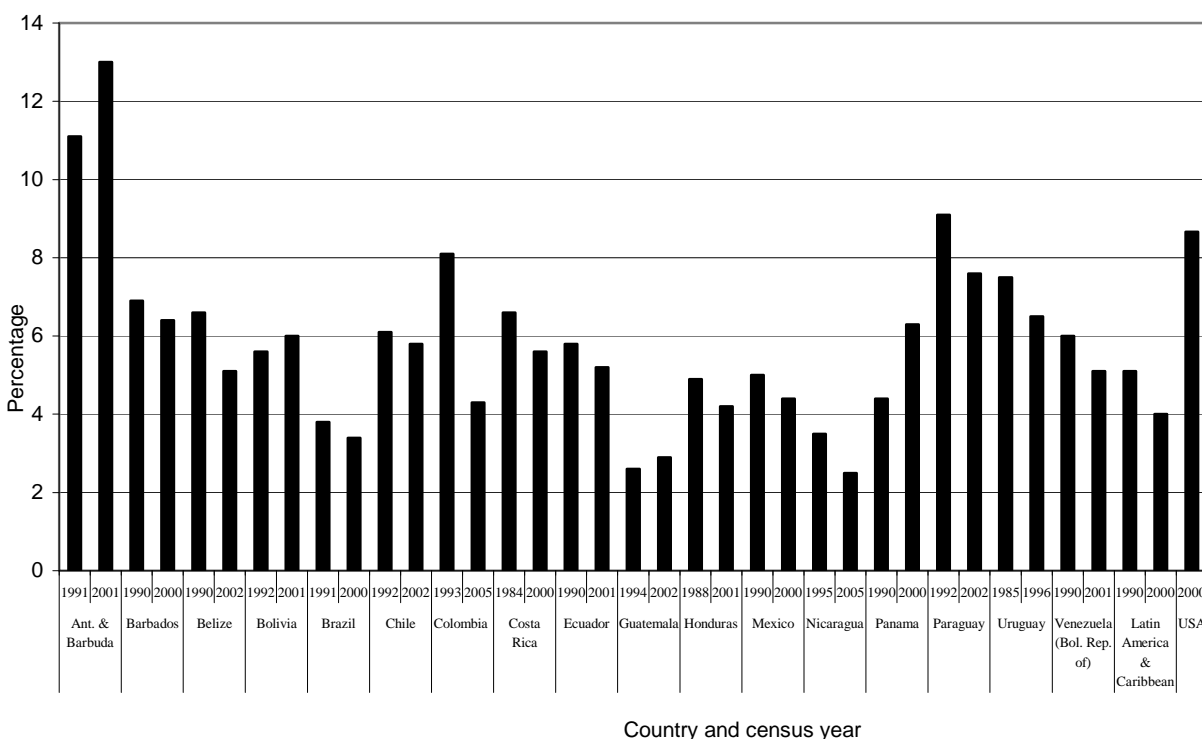
Source: Special processing of census micro-data: 18 countries in 1990 and 20 in 2000 (not all countries had data for all four types of migration). Accessed 5 January 2008.

This unexpected downward trend may be explained by the arguments mentioned above, but that still require further research. However, it seems unlikely that the observed trend is due to a reduction in territorial inequalities within countries, as these remain extremely high in the region (ILPES, 2007).⁷

2. *Do internal migratory flows follow the expected pattern from less to more developed areas?*

Territorial inequalities are the main trigger for migration (Lall, Selod and Shalizi, 2006; Lucas, 1997). The search for better opportunities therefore remains the main cause of internal migration. This is the dominant hypothesis in the literature on the direction of migratory flows: movement should take place from areas with less favourable living conditions to those with better living conditions. Although this might sound obvious, the definition of “living conditions” depends on the way individuals assess the different dimensions of well-being and on how they view their opportunities of attaining such living conditions at origin or in alternative destinations.

Figure 4. Latin America and the Caribbean and the United States: recent internal migration rate (five years prior to census) between major administrative divisions (countries with available census rounds 1990 and 2000)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), *Social Panorama of Latin America, 2006* (LC/G.2351-P/E), Santiago, Chile, 2007; and United States Census Bureau. Available from http://factfinder.census.gov/servlet/QTTable?_bm=n&_lang=en&qv_name=DEC_2000_SF3_U_DP2&ds_name=DEC_2000_SF3_U&geo_id=01000US.

Traditionally, priority has been given to employment, particularly to salaries, as a key dimension of living conditions. However, there are other important dimensions, such as education and housing. In fact, research conducted in the region indicates that housing (including the accommodation, location and quality of life) is the most relevant factor in intra-urban migration, suburbanization and counter-urbanization (ECLAC, 2007). The increasingly heterogeneous migratory patterns are the result of diversification of determining factors, and cast doubt on the usefulness of single and universal theoretical and analytical models to explain migration.

The main determining factors of large-scale migration between major administrative units still appear to be the differences in socio-economic development (indexed by average wages and indicators such as education, life expectancy and GDP) between said geographical units. Migration flows would therefore be expected from administrative units with lower wages and worse living conditions towards those that offer higher wages and better living conditions.

The available evidence shows that, in most of the region, at the subnational level, there is a positive relationship between the human development index (HDI) -calculated by the national offices of the United Nations Development Programme (UNDP)- and the net migration rate (see table 6). In some countries (e.g. Bolivia, Cuba, Ecuador or Honduras), the correlation is strong and highly significant. However, in others (Chile, Nicaragua, Uruguay, Venezuela) the correlation is weak, and not statistically significant.

TABLE 6. SIMPLE LINEAR CORRELATION BETWEEN THE HUMAN DEVELOPMENT INDEX (HDI) AND THE NET RATE OF INTERNAL MIGRATION BY MAJOR ADMINISTRATIVE UNIT IN SELECTED COUNTRIES OF LATIN AMERICA AND THE CARIBBEAN, 2000 ROUND OF CENSUSES

Country, reference year, number of divisions with data, and indicator	Simple correlation between indicator and rate of net migration (p-value between brackets)	
Argentina, 2001: 24 units, HDI 1996	0.407	(0.0242)*
Bolivia, 2002: 9 units, HDI 1994	0.619	(0.0378)*
Brazil, 2000: 27 units, HDI 1996	0.451	(0.0091)*
Chile, 2002: 13 units, HDI 1998	-0.01136	(0.5147)
Colombia, 2005: 24 units, HDI, 2000	0.414	(0.0222)*
Cuba, 2002: 14 units, HDI 1996	0.770	(0.0006)*
Ecuador, 2001: 15 units, HDI, 1999	0.650	(0.0044)*
Guatemala, 2002: 22 units, HDI 1995-1996	0.442	(0.01972)*
Honduras, 2001: 18 units, HDI 1996	0.697	(0.0006)*
Mexico, 2000: 32 units, HDI 1995	0.408	(0.0102)*
Nicaragua, 2005: 17 units, HDI 2000	0.055	(0.4170)
Panama, 2000: 12 units, HDI 2000	0.484	(0.0554)
Paraguay, 2002: 18 units, HDI 2000	0.133	(0.29936)
Uruguay, 1996: 19 units, HDI 1991	0.063	(0.60097)
Venezuela, 2001: 23 units, HDI 1996	0.0686	(0.3780)

Source: Migration rates, special processing of microdata from the relevant censuses; socio-economic data, national human development reports and official subnational statistics. P-values from correlations. Available from <http://home.clara.net/sisa/signif.htm>.

- Significant at the 95 per cent level (p-value<0.05). Accessed 5 January 2008.

. Diagram 1 shows major administrative units classified by the sign of net migration in two different periods of time⁸ –corresponding to the 1990 and 2000 census rounds. Net migration is not systematically associated with the level of development of the different units. Several of these units are exceptional; namely, they are either: (a) colonization regions; (b) regions with recent economic progress; (c) “metropolitan” regions undergoing suburbanization and/or deconcentration; and (d) regions close to metropolitan areas undergoing suburbanization. Thus, migratory patterns in these regions may be explained by factors other than their level of development.

DIAGRAM 1 CLASSIFICATION OF MAJOR ADMINISTRATIVE UNITS BY INTERNAL MIGRATION STATUS IN THE CENSUS ROUNDS 1990 AND 2000 IN SELECTED CITIES OF LATIN AMERICA AND THE CARIBBEAN

Antigua and Barbuda			Barbados		
	Population gains Net migration (+) 2001-1996	Population losses Net migration (-) 2001-1996		Population gains Net migration (+) 2000-1995	Population losses Net migration (-) 2000-1995
Net migration (+)	St. John's Rural; St. George's; St. Peter's		Net migration (+)	St. Peter; St. Philip; Christ Church; St. James	
1992-1987			1991-1986		
Net migration (-)		St. Phillip's; St. Paul's St. Mary's; St. John's City; Barbuda	Net migration (-)	St. George; St. Thomas	St. Michael; St. John; St. Joseph; St. Andrew; St. Lucy
1992-1987			1991-1986		

DIAGRAM 1 (CONTINUED)

Belize			Bolivia		
	Population gains Net migration (+) 2001-1996	Population losses Net migration (-) 2001-1996		Population gains Net migration (+) 2001-1996	Population losses Net migration (-) 2001-1996
Net migration (+) 1992-1987	Cayo District	Belize District	Net migration (+) 1992-1987	Cochabamba; Tarija; Santa Cruz; Pando	Beni
Net migration (-) 1992-1987	Stann Creek District	Corozal District; Orange Walk District; Toledo District	Net migration (-) 1992-1987		Chuquisaca; La Paz; Oruro; Potosí
Brazil			Chile		
	Population gains Net migration (+) 2000-1995	Population losses Net migration (-) 2000-1995		Population gains Net migration (+) 2002-1997	Population losses Net migration (-) 2002-1997
Net migration (+) 1991-1986	Amazonas; Roraima; Amapá; Tocantins; Espírito Santo; São Paulo; Santa Catarina; Mato Grosso; Goiás; Federal District; Rondônia	Pará; Sergipe; Mato Grosso do Sul	Net migration (+) 1992-1987	Valparaíso; Tarapacá	Atacama; Metropolitan area of Santiago
Net migration (-) 1991-1986	Rio Grande do Norte; Minas Gerais; Rio de Janeiro	Acre; Maranhão; Piauí; Ceará; Paraíba; Pernambuco; Alagoas; Bahia; Paraná; Rio Grande do Sul	Net migration (-) 1992-1987	Antofagasta; Coquimbo; Lib. Gral. Bernardo O'Higgins; Los Lagos	Maule; Bío Bio; La Araucanía; Aisén; Magallanes and Antarctic
Colombia			Costa Rica		
	Population gains Net migration (+) 2005-2000	Population losses Net migration (-) 2005-2000		Population gains Net migration (+) 2001-1996	Population losses Net migration (-) 2001-1996
Net migration (+) 1993-1988	Bogotá; Risaralda; Valle; Casanare; Cundinamarca; Quindío	Bolívar; Atlántico; Guajira; Arauca	Net migration (+) 1984-1979	Alajuela; Cartago; Heredia; Limón	
Net migration (-) 1993-1988	Antioquia; Santander; Meta	Boyacá; Caldas; Cauca; Córdoba; Chocó; Huila; Magdalena; Nariño; Sucre; Tolima; Amazonas; Caquetá; Cesar; Norte. Santander; Putumayo; San Andrés; Guaviare; Vichada	Net migration (-) 1984-1979		San José; Guanacaste; Puntarenas
Cuba			Ecuador ²		
	Population gains Net migration (+) 2002-1997	Population losses Net migration (-) 2002-1997		Population gains Net migration (+) 2001-1996	Population losses Net migration (-) 2001-1996
Net migration (+) 1981-1976	Havana; Havana City; Matanzas; Cienfuegos; Ciego de Ávila; Camagüey; Isla de la Juventud		Net migration (+) 1990-1985	El Oro; Guayas; Pastaza; Pichincha; Galápagos; Sucumbíos	Morona Santiago; Napo; Zamora Chinchipe
Net migration (-) 1981-1976	Sancti Spíritus	Pinar del Río; Villa Clara; Las Tunas; Holguín; Ganma; Santiago de Cuba; Guantánamo	Net migration (-) 1990-1985	Azuay; Cañar	Bolívar; Carchi; Cotopaxi; Chimborazo; Esmeraldas; Imbabura; Loja; Los Rios; Manabí; Tungurahua

DIAGRAM 1 (CONTINUED)

Guatemala			Honduras		
	Population gains Net migration (+) 2002-1997	Population losses Net migration (-) 2002-1997		Population gains Net migration (+) 2001-1996	Population losses Net migration (-) 2001-1996
Net migration (+) 1994-1989	Guatemala; Sacatepéquez; Peten		Net migration (+) 1988-1983	Atlántida; Cortés; Francisco Morazán; Islas de la Bahía	Colón; Comayagua; Yoro
Net migration (-) 1994-1989	Chimaltenango; Escuintla	El Progreso; Santa Rosa; Sololá; Totonicapán; Quetzaltenango; Suchitepéquez; Retalhuleu; San Marcos; Huehuetenango; Quiché; Baja Verapaz; Alta Verapaz; Izabal; Zacapa; Chiquimula; Jalapa; Jutiapa	Net migration (-) 1988-1983		Copán; Choluteca; El Paraíso; Gracias a Dios; Intibuca; La Paz; Lempira; Ocotepeque; Olancho; Santa Bárbara; Valle
Mexico			Nicaragua		
	Population gains Net migration (+) 2000-1995	Population losses Net migration (-) 2000-1995		Population gains Net migration (+) 2005-2000	Population losses Net migration (-) 2005-2000
Net migration (+) 1990-1985	Aguascalientes; Baja California; Baja California Sur; Campeche; Colima; Chihuahua; Guanajuato; Jalisco; México; Morelos; Nuevo León; Querétaro de Arteaga; Quintana Roo; Sonora; Tamaulipas; Tlaxcala		Net migration (+) 1995-1990	Atlántico Norte; Managua; Río San Juan	Jinotega
Net migration (-) 1990-1985	Coahuila; Hidalgo; Yucatán	Chiapas; Federal District; Durango; Guerrero; Michoacán; Nayarit; Oaxaca; Puebla; San Luis Potosí; Sinaloa; Tabasco; Veracruz Llave; Zacatecas	Net migration (-) 1995-1990	Masaya; Granada; Carazo; Rivas; Nueva Segovia	Madriz; Estelí; Chinandega; León; Matagalpa; Boaco; Chontales; Atlántico Sur
Panama ³			Paraguay		
	Population gains Net migration (+) 2000-1995	Population losses Net migration (-) 2000-1995		Population gains Net migration (+) 2002-1997	Population losses Net migration (-) 2002-1997
Net migration (+) 1990-1979	Panama	Bocas del Toro; Darién	Net migration (+) 1992-1987	Alto Paraná; Boquerón; Canindeyú; Central	
Net migration (-) 1984-1979		Coclé; Colón; Chiriquí; Herrera; Los Santos; Veraguas	Net migration (-) 1992-1987	Presidente Hayes	Alto Paraguay; Amambay; Asunción; Caaguazú; Caazapá; Concepción; Cordillera; Guaira; Itapú; Misiones; Neembucu; Paraguari; San Pedro
Uruguay			Venezuela (Bolivarian Republic) ⁴		
	Population gains Net migration (+) 1996-1991	Population losses Net migration (-) 1996-1991		Population gains Net migration (+) 2001-1996	Population losses Net migration (-) 2001-1996
Net migration (+) 1985-1980	Canelones	Artigas; Cerro Largo; Montevideo; Rivera; Rocha; Treinta y Tres	Net migration (+) 1990-1985	Lara; Anzoategui; Aragua; Barinas; Carabobo; Cojedes; Miranda; Nueva Esparta; Amazonas;	Bolívar
Net migration (-) 1985-1980	Maldonado; San José	Colonia; Durazno; Flores; Florida; Lavalleja; Paysandú; Río Negro; Salto; Soriano; Tacuarembó	Net migration (-) 1990-1985	Delta Amacuro; Mérida; Monagas; Yaracuy	Apure; Falcon; Guarico; Sucre; Tachira; Trujillo; Zulia; Capital District; Portuguesa

Source: Prepared by the author with information from database on Internal Migration in Latin America and the Caribbean (MIALC), available from www.eclac.cl/migracion/migracion_interna/ special processing of census microdata, online processing of the 2005 census of Colombia available from <http://200.21.49.242/cgi-bin/RpWebEngine.exe/PortalAction?&MODE=MAIN&BASE=CG2005BASICO&MAIN=WebServerMain.inl> and data received from the National Statistical Office (ONE) of Cuba. Accessed 5 January 2008.

¹ No information available for the major administrative units of Guainia and Vaupes in the census of 1993.

² No information available for the major administrative unit of Orellana in the census of 1990.

³ No information available for the major administrative units (Comarcas) of Kuna Yala, Emberá and Comarca Gnohe Bugle in the 1990 census.

⁴ No information available for the major administrative units Vargas and Federal Dependencies in the census of 1990.

Until the 1980s, policies were in place to promote migration to colonization regions (ECLAC, 2007; CELADE, 1984). These policies are no longer in place, probably due to funding restrictions, negative assessments of their results, criticism of their limited consideration of human rights or increased awareness of their adverse effects on the environment. In some countries the disappearance of colonization programmes resulted in net emigration from the areas concerned, as in the region of Aysén in the south of Chile, and in the Beni region in Bolivia. Other areas remained attractive, such as the eastern part of Bolivia, the Brazilian Amazon region and the extreme south of Argentina (map 2). This suggests that an abundance of natural resources (particularly land) and the expectation of fast profits can supersede more traditional pull factors such as average wages and living conditions.

In regions with recent economic progress, wages and living conditions may even be lower than the national average because their initial levels were low. Such regions, however, have high rates of job creation and good prospects that generate expectations of individual and regional advancement. The productive and migratory dynamics of these regions are closely linked to the world economy, as they are usually areas sustained by the successful role they play on the global markets, either in primary products (fish farming and forestry in the Lake Region of Chile), tourism (in the state of Yucatán, Mexico), industry (province of San Luis, Argentina) or remittances (province of Azuay, Ecuador) (see maps in annex). In the future, the economic buoyancy of these major administrative units may result in high salaries and good living conditions, in which case they will cease to be anomalous poles of attraction. However, as their attraction is critically dependent on world markets, their situation could change in the event of a world recession for the opposite reason: they could become wealthy regions in crisis, and would therefore be sources of emigration.

The other two types of “anomalous” major administrative units, in terms of the relationship between net migration and human development, are affected by the suburbanization process. The lack of land for housing in central areas means that cities expand horizontally. This is a complex process that can manifest itself in many different ways. Historically in Latin America, it has resulted in the rapid expansion of the outskirts of cities where cheaper or more easily available land has attracted mainly poor migrants from other parts of the country or from within the city. Thus, an effect of saturation-suburbanization has been that many major administrative units that include the main city (City of Buenos Aires in Argentina, Federal District in Mexico, Montevideo in Uruguay, Capital District in the Bolivarian Republic of Venezuela) have registered net emigration, despite their having the highest income and best living conditions in their respective countries (see maps in the Annex). That pattern is largely due to the fact that those units are relatively small. Although the cities within those major administrative units only accounted for a small part of their total area in the early twentieth century, they became saturated due to the rapid growth of cities during the century, and the urban sprawl spilled out into neighbouring units. This transformed the latter into very strong poles of attraction (see maps), despite their rather low standards of living and income.

As a result, any consideration of migratory patterns associated with metropolitan units must also include other divisions affected by the urban sprawl of the city. On an operational level, this implies carrying out a more disaggregated analysis of migration (for instance at the municipal level)—an exercise that is presented later in the document. More specifically, that exercise will assess whether big cities register emigration even after controlling for the effect of suburbanization.

In summary, although better living conditions remain one of the most powerful magnets to migrants, they may be offset by a temporal lag between those conditions resulting from long processes of change, economic buoyancy -which is more volatile and partly independent from living conditions- and the possibility of enjoying those advantages without living in places in high demand due to suburbanization. In addition, the driving forces of production, which operate as part of globalisation and

the new economy of services and technology, have the capacity to change the attractiveness of areas according to diverse and rapidly changing factors.

3. Does internal migration reduce or deepen territorial disparities?

The more direct impact of migration on origin and destination areas is on the total population of the areas. Generally speaking, migration tends to promote convergence between regions in terms of demographic growth, as poles of attraction are usually the wealthier regions that are also more advanced in terms of demographic transition, and therefore have lower levels of natural increase. However, migration also affects the structure of the population and, through it, the socio-demographic composition of different regions. For instance, if women migrate to areas with high proportions of men, the sub-national imbalances in the population by sex will be reduced.

Given the evidence of a positive relationship between development and migratory attraction, and considering the historic selectivity of Latin America's internal migration in terms of age, gender and level of schooling (Rodríguez, 2004a), internal migration should be broadening territorial differences in population structure by age, sex and level of education. For instance, more developed regions have a greater proportion of women and higher levels of education, in part because of prior immigration. As such areas remain net recipients of mainly female migrants and people with above-average education, migration will deepen regional disparities in terms of gender and schooling. In terms of age structures, migration could be expected to widen disparities in dependency ratios. Since emigration from less developed areas tends to involve young adults, the proportion of children in the total population left behind, which tends to be higher in such areas as they are at an earlier stage of demographic transition, will increase.

The procedure for empirically assessing this hypothesis was devised by CELADE and has been included in many publications since 2004 (Rodríguez, 2007, 2004a and 2004b; ECLAC, 2007). The main idea is to take the matrix of flow indicators (from the recent migration matrix), compare the marginals⁹ and use the difference to verify if migration had a net and exclusive impact in reducing or increasing disparities. A synthetic indicator was used to show how individual effects impact on territorial disparities: the bivariate correlation coefficient between the (net and exclusive) effect of migration and the initial level of the variable affected (sex ratio, age structure, level of schooling). If there is a positive correlation between the effect of migration and the initial value of the variable, then migration would be deepening territorial gaps. If the correlation is negative, on the other hand, migration would be narrowing the territorial gaps. Table 7 shows these empirical correlations for the countries with available data.

First, in the vast majority of countries, migration between major administrative units generally widens territorial disparities in the proportion of children, although the correlation coefficient is significant at the 95 per cent level in only four countries. The prevalence of positive coefficients suggests that those divisions with the highest initial proportion of children (typically the poorest areas) tend to show the highest average increases in that proportion due to migratory exchanges with other units. The underlying mechanism is indirect, as it is the mass exit of young people, rather than the arrival of children, that increases the proportion of children under the age of 15 in such divisions.

TABLE 7. CORRELATION BETWEEN SELECTED SOCIO-DEMOGRAPHIC VARIABLES AND CHANGES IN THEIR VALUE DUE TO RECENT INTERNAL MIGRATION IN SELECTED COUNTRIES OF LATIN AMERICA AND THE CARIBBEAN, 2000 ROUND OF CENSUSES

Country	Percentage of Children	Percentage of older adults	Masculinity ratio	Average years of schooling (age 30-59)
Argentina, 2001	0.61	-0.04	0.64	0.02
Bolivia, 2002	-0.32	0.67	0.17	0.85
Brazil, 2000	0	0.47	0.46	-0.02
Chile, 2002	0.18	0.61	0.78	-0.71
Costa Rica, 2000	0.42	0.35	0.27	0.06
Ecuador, 2001	-0.13	0.43	0.47	-0.55
Guatemala, 2002	0.21	-0.21	0.48	-0.04
Honduras, 2001	0.62	0.44	0.43	-0.7
Mexico, 2000	0.29	0.5	0.19	-0.22
Panama, 2000	-0.24	0.23	0.87	0.31
Paraguay, 2002	0.26	0.17	0.84	-0.38
Dominican Republic, 2002	0.8	0.2	0.92	-0.16
Venezuela (Bolivarian Republic of), 2001	0.61	-0.04	0.64	0.02

Source: Prepared by the author on the basis of information from the database on Internal Migration in Latin America and the Caribbean (MIALC) and procedures as described in the body of the text. Available from http://www.eclac.cl/migracion/MIGRACION_INTERNA/. Accessed 8 January 2008.

NOTE: coefficients that are significant to a significance level of 95 per cent are highlighted in bold.

Migration between major administrative units also increases disparities in the territorial distribution of the population by sex. This distribution has been shaped by migratory flows, particularly those from rural to urban areas, and has the following basic imbalance: a majority of women in the most urbanized major administrative units that have traditionally been poles of attraction. According to the ratios included in table 7 (most of which are significant at the 95 per cent level), recent migration has widened this gap: the proportion of men has increased in units with initially higher sex (male/female) ratios due to the net effect of migration. In contrast, the evidence suggests, in some cases, migration contributes to a more balanced territorial distribution of the population by education: the correlation coefficient is negative in eight out of the 13 countries studied (and statistically significant in three cases)

4. Does emigration from poor areas contribute to increases in poverty?

Emigration regions with chronic poverty tend to be territorially clustered together in one or more vast socio-economically disadvantaged sub-national areas (see maps in Annex). Typical examples include the northwest of Argentina, the northeast of Brazil, Bolivia's "Altiplano," south-central Chile, western Cuba and the south of Mexico.

Table 8 shows six countries in which the depressed regions are relatively easy to identify. Results are broken down by political and administrative unit within the regions of net emigration according to the most recent census (i.e., most units in those areas). Emigration has a systematic effect on the age structure, as it tends to raise the proportion of children and older adults at the expense of the working-age population. As a result, emigration increases the demographic dependency ratio of the depressed regions, and therefore their demographic burden.¹⁰ In addition, in the large majority of units studied, migration tends to reduce the average level of schooling, thereby affecting the limited human capital of those areas.

5. Is the rural exodus an ongoing phenomenon?

Although the paper has given a tentative answer to this question by noting the continued process of urbanization, this section focuses specifically on the trends of rural-to-urban migration. In the 2000 round of censuses, only four countries in the region (Brazil, Nicaragua, Panama and Paraguay) included questions that allow for a direct estimate of rural-to-urban migration and therefore identify the four potential flows between the two areas. Table 9 summarises those results: with the exception of Nicaragua (where the rural-to-urban flow was by far the strongest), migration between urban areas was the predominant flow.¹¹ That was to be expected given the region's high levels of urbanization.

The figures also show that there are no counter-urbanization processes under way, as there is still a net transfer of population from the countryside to the city.¹² Flows from the city to the countryside are mainly associated with processes of suburbanization, which means that they do not fit in with the hypothesis of a "return to the countryside." (Guzmán and others, 2006; Ferras, 2007).

Migration between rural areas is often the least significant flow. This is partly due to advancing urbanization, the decline of colonization programmes and the depletion of agricultural land. Nonetheless, this flow could be underestimated due to the seasonal nature of many flows that are not captured by censuses. Nonetheless, and whatever the level of such flows, this form of migration deserves special attention because of the severe impact it can have on the environment, particularly in terms of movements towards the agricultural frontier or settlement areas (Reboratti, 1990; Pinto da Cunha, 2007).

Given that the direct estimates shown in table 9 refer to only four countries and that the results appear inconclusive, the use of indirect estimates in this case offers a more complete overview of the net balance of rural-to-urban migration. The figures in table 10 are based on an indirect method ("intercensal survival ratios"¹³) and lead to the following conclusions. First, all countries in the region continue to register net rural emigration. Second, this migration is no longer the main source of growth of the urban population, and its share fell from 36.6 per cent in the 1980s to 33.7 per cent of total urban growth in the 1990s.¹⁴ Third, the situation is highly uneven among countries: predictably, the significance of rural-to-urban migration for urban population growth is higher in less urbanized countries. Fourth, in terms of the rural population itself, the net transfer from the countryside to the city remains high (see figure 1), and some countries such as Brazil still register what could be termed a mass exodus, as the flows involve a substantial proportion of the country's total rural population.

TABLE 8. MAJOR ADMINISTRATIVE UNITS IN HISTORICALLY DISADVANTAGED AREAS OF NET EMIGRATION, BY EFFECT OF INTERNAL MIGRATION ON THE AGE STRUCTURE AND SCHOOLING OF THE POPULATION

North of Argentina (NOA)					Altiplano of Bolivia					Southern Central Chile				
Major administrative unit of net emigration	Net rate of migration (per thousand)	Proportion of children	Proportion of older adults	Schooling of heads of household	Major administrative unit of net emigration	Net rate of migration (per thousand)	Proportion of children	Proportion of older adults	Schooling of heads of household	Major administrative unit of net emigration	Net rate of migration (per thousand)	Proportion of children	Proportion of older adults	Schooling of heads of household
Salta	-0.91	0.69	0.7	-0.082	Chuquisaca	-6.27	0.76	1.73	1.724	Del Maule	-0.42	1.73	1.22	0.19
Jujuy	-2.09	1.3	1.05	-0.735	La Paz	-3.11	0.14	0.2	-0.393	Bio Bio	-2.21	1.15	1.18	-0.46
Tucumán	-0.27	0.04	0.29	-0.006	Oruro	-8.88	2.38	2.94	-2.268	Araucania	-0.48	1.66	1.19	0.25
Santiago del Estero	-1.4	0.87	0.71	-0.143	Potosí	-14.76	1.67	3.34	-2.168					
Northeast of Brazil					Sierra region (highlands) of Ecuador					Southern Mexico				
Major administrative unit of net emigration	Net rate of migration (per thousand)	Proportion of children	Proportion of older adults	Schooling of heads of household	Major administrative unit of net emigration	Net rate of migration (per thousand)	Proportion of children	Proportion of older adults	Schooling of heads of household	Major administrative unit of net emigration	Net rate of migration (per thousand)	Proportion of children	Proportion of older adults	Schooling of heads of household
Maranhão	-6.88	0.77	2.52	-0.248	Carchi	-13.13	2.91	2.27	-1.9833	Oaxaca	-4.24	0.79	1.68	0.039
Piauí	-4.06	1.32	1.83	-0.657	Imbabura	-1.89	1.08	0.85	0.23049	Guerrero	-6.42	0.36	2.14	-0.149
Ceará	-0.72	0.47	0.57	0.599	Cotopaxi	-5.13	1.40	0.99	-0.2953	Chiapas	-2.85	0.69	0.99	-0.268
Paraíba	-3.92	0.82	1.86	-0.173	Tungurahua	-1.79	0.94	0.20	-0.2927	Puebla	-1.14	0.28	0.37	0.068
Pernambuco	-3.21	0.49	1.14	-0.072	Bolivar	-15.16	3.67	2.36	-3.0228	Veracruz	-6.89	1.66	2.98	-0.971
Alagoas	-5.70	0.4	2.61	-0.033	Chimborazo	-9.01	1.91	2.56	0.15052					
Sergipe	-0.61	0.31	1.13	-0.063	Loja	-9.30	2.47	2.30	-0.5514					
Bahia	-4.50	0.42	1.95	0.081										

Source: Prepared by the author on the basis of information database on Internal Migration in Latin America and the Caribbean (MIALC) available from www.eclac.cl/migracion/migracion_interna/ and procedures as described in the body of the text. Accessed 6 January 2008.

TABLE 9. DIRECT ESTIMATES OF RECENT MIGRATION BETWEEN URBAN AND RURAL AREAS, POPULATION AGED 5 AND ABOVE, 2000
ROUND OF CENSUSES

Country and census	Current area of residence	Area of residence 5 years earlier		
		No migration between minor administrative units	Urban	Rural
Brazil, 2000	Urban	111 027 460	10 775 021	3 244 288
	Rural	24 965 713	2 168 599	1 161 891
Nicaragua, 2005	Urban	2 109 103	67 567	338 008
	Rural	1 744 706	119 443	64 210
Panama, 2000	Urban	1 297 825	152 089	74 836
	Rural	832 551	40 798	29 741
Paraguay, 2002	Urban	2 175 943	248 014	31 361
	Rural	1 734 786	91 592	53 867

Source: Prepared by the author, on the basis of special processing of census microdata.

NOTE: The calculations exclude children under the age of 5 for recent migration; those born or living in other countries five years earlier in the analysis of absolute and recent migration, respectively; and cases of no reply or outlier replies to base questions (usual place of residence, birth and residence five years previously) in the interest of data quality. In this table, some countries capture rural-to-urban migration within minor administrative divisions (Brazil, Paraguay), while others do not (Nicaragua, Panama), which means that any comparison between them should be made cautiously.

TABLE 10. NET RURAL-TO-URBAN MIGRATION AND URBAN POPULATION GROWTH, POPULATION AGED 10 AND ABOVE

Countries	Net rural-to-urban migration		Growth of urban population aged 10 and over		Proportion of urban growth attributable to net rural-to-urban migration	
	1980-1990	1990-2000	1980-1990	1990-2000	1980-1990	1990-2000
Argentina	1 248 867	829 981	4 146 455	3 414 868	30.1	24.3
Bolivia	565 718	341 525	882 210	1 174 625	64.1	29.1
Brazil	9 167 628	9 483 867	22 868 322	26 856 555	40.1	35.3
Chile	146 535	382 623	1 447 011	1 939 951	10.1	19.7
Colombia	-	-	-	-	-	-
Costa Rica	82 656	338 002	194 507	717 006	42.5	47.1
Cuba	735 083	370 110	1 525 671	918 531	48.2	40.3
Ecuador	647 934	612 251	1 341 021	1 598 897	48.3	38.3
El Salvador	294 277	-	535 196	-	55.0	-
Guatemala	226 021	824 486	525 724	1 384 850	43.0	59.5
Honduras	258 003	303 742	501 918	685 610	51.4	44.3
Mexico	3 997 266	4 183 486	12 108 257	13 103 802	33.0	31.9
Nicaragua	139 920	-	484 649	-	28.9	-
Panama	113 677	234 038	292 298	432 624	38.9	54.1
Paraguay	280 103	296 914	504 441	652 302	55.5	45.5
Peru	1 001 406	-	2 990 661	-	33.5	-
Dominican Republic	218 172	553 575	709 784	1 096 408	30.7	50.5
Uruguay	83 300	34 446	233 238	132 306	35.7	26.0
Venezuela (Bolivarian Republic of)	735 042	847 392	3 171 190	4 235 917	23.2	20.0
Total	19 941 608	19 636 438	54 462 553	58 344 252	36.6	33.7

Source: Prepared by the author, using indirect technique (intercensal survival ratios).

6. *Largest cities, primacy index and migratory attraction: concentrated deconcentration?*

As shown in section 3, the historically high “primacy” indexes observed in most national urban systems in the region are declining. What follows is a more detailed analysis of the migratory flows related with this trend for the three largest cities in 10 selected countries of the region. The analysis will also examine specific migratory patterns for the indigenous and the non-indigenous population.

The results in Table 11 show that the majority of the region’s largest cities remain attractive, as they continue to register net immigration. In countries such as Bolivia, Ecuador, Honduras, Panama and Paraguay, almost all of which have an urban percentage below the regional average, the biggest city (or the two most populated) is still major a pole of attraction.¹⁵ However, one in every three of these cities registers net population outflows, a situation unheard of before the late 1980s in the region.

In particular, most of the region’s largest cities (with 5 million or more inhabitants) show net emigration, many of them since the 1980s. This change is very likely due to the onset of diseconomies of scale and the shift of urban investment to other areas (UNFPA, 2007; Montgomery, 2004; Henderson, 2000). Other possible factors include difficulties of governance and the proliferation of urban problems such as lack of public safety, traffic congestion and pollution. Overall, these cities continue to receive strong inflows of immigrants; what has changed is that they have lost much of their retentive capacity.

The flows from mega-cities was divided into the categories short-distance migration and long-distance migration (table 11) to examine the hypothesis of “concentrated deconcentration,” according to which people could be emigrating to areas nearby urban centers, as part of a process of suburbanization, city sprawl or creation of mega-regions¹⁶ (Sassen, 2007; Diniz, 2007). The data show that short-distance emigration was relevant mainly in the mega-cities of Brazil, as net emigration from Greater São Paulo and Greater Rio de Janeiro was indeed exclusively due to exchanges with other municipalities within the same state, while both agglomerations continued to gain population from migratory exchanges with other states. In all other countries, most cities experienced both short-distance and long-distance emigration or only long-distance net emigration, which suggests that there was some “deconcentration”. However, in several cities that remain poles of attraction, the migratory patterns fit the hypothesis of “concentrated deconcentration” associated to suburbanization; for example Guatemala City, Quito, San Pedro Sula and Heredia.

Lastly, migration trends tend to be similar for indigenous and non-indigenous groups, which suggests that the push and pull factors of cities have no ethnic bias. However, a difference based on ethnic origin can be observed in cities like La Paz, Cochabamba, Tegucigalpa, Mexico City, Guadalajara and Asunción, in that they are losing non-indigenous population while gaining indigenous population. This directly contributes to an increase in the proportion of indigenous people in these cities, but perhaps more importantly, indigenous peoples are entering cities that are no longer attractive to non-indigenous people. The reasons for this, and its implications, should be the subject of further investigation.

C. POLICY IMPLICATIONS

The diversity of current internal migration trends calls for an approach with a wide range of policies, programmes and measures to deal with the different issues. It also requires greater knowledge, precision

and judgment among policymakers, who must decide how to intervene based on the type of migration they are attempting to influence. Any strategy in this area should adhere to the principle of respecting the right to migrate within a country in the best possible conditions, and preventing forms of discrimination that lead to poverty traps.

The four pillars of the strategies to manage internal migration are: incentives for individuals and companies, geographical allocation of infrastructure and public services, instruments of territorial land-use planning and economic regeneration, and knowledge and management of unforeseen migratory effects of various social policies.

Illustrative examples of the above are urban regeneration and resettlement programmes in central areas. To attract migrants into city centres, decision-makers and experts have at their disposal a vast repertoire of economic, social and administrative instruments (subsidies, service location and amendment of land-use regulations). There is, however, a negative side to this advantage, as these instruments were not designed to influence intra-urban migration, but to organize the city and optimize its functioning, which should remain as their highest-priority strategic objectives. If the migration forces are very strong, using these instruments to counteract them may generate imbalances that will eventually result in costs for the city and its inhabitants, such as rising land prices, overcrowding, congestion, urban sprawl, residential segregation, etc. As is often the case, having policy instruments is one thing, implementing them with no negative side-effects quite another.

While specific policies to halt advancing urbanization or rural-to-urban migration have proved unsuccessful, not to mention ill-advised and sometimes plain wrong according to some experts (UNFPA, 2007), many countries would nonetheless like to redirect migratory flows between cities. According to recent studies (ILPES, 2007; UNFPA, 2007; Cohen, 2006; Guzmán and others., 2007; Davis and Henderson, 2003), the authorities of countries that consider the population to be overly concentrated in the main city favour a solid, dense and diversified urban network as being more conducive to national development. However, there is an ongoing debate on the effectiveness of programmes implemented to reduce such concentration. The seemingly natural idea of promoting some cities to the detriment (if only by omission) of others must pass several tests: it must benefit national development, it must be consistent with or at least not contradict national and global market-based economics, to be acceptable to local stakeholders, and to respect individual rights. There are clearly many limitations to the discretionary nature of public action in this domain.

Lastly, it is worth highlighting those public policies that are formulated without consideration for the mobility of the population. These include housing and transportation policies, which have direct consequences on the attractiveness and effective changes of residence, particularly within cities or between cities and their surrounding areas. These effects should clearly be taken into account when formulating such policies. Going one step further, they could even be devised to have a certain impact on migration and mobility, without neglecting their main objectives of providing good-quality connections and living environments for the population.

TABLE 11. INTERNAL MIGRATION IN THE THREE MAIN METROPOLITAN AREAS IN SELECTED COUNTRIES OF LATIN AMERICA,
1990 AND 2000 CENSUS ROUNDS

Country and year	Metropolitan area	Indigenous				Non-indigenous				Total		
		Net migration	Rate (per 1000)	Net short-distance migration	Net long-distance migration	Net migration	Rate (per 1000)	Net short-distance migration	Net long-distance migration	Net migration	Rate (per 1000)	Net short-distance migration
Bolivia, 2001	La Paz	12 212	2.9	23 961	-11 749	-6 978	-3.8	3 140	-10 118	5 234	27 101	-21 867
	Santa Cruz	24 279	17.9	-338	24 617	21 532	7.0	2 110	19 422	45 811	1 772	44 039
	Cochabamba	752	0.6	-1 159	1 911	-2 528	-3.0	-1 242	-1 286	-1 776	-2 401	625
Brazil, 2000	São Paulo	-164	-1.1	-747	583	-231 657	-2.9	-339 707	108 050	-231 821	-340 454	108 633
	Rio de Janeiro	435	3.1	-175	610	-29 854	-0.6	-49 505	19 651	-29 419	-49 681	20 262
	B. Horizonte	311	4.3	89	222	61 886	3.4	42 691	19 195	62 197	42 780	19 417
Chile, 2002	Santiago	-411	-0.5	-947	536	-49 306	-2.1	-30 945	-18 361	-49 717	-31 892	-17 825
	Valparaíso	231	5.4	24	207	8 927	2.5	1 361	7 566	9 158	1 385	7 773
	Concepción	-387	-5.4	-46	-341	-7 438	-2.5	711	-8 149	-7 825	665	-8 490
Costa Rica, 2000	San José	-78	-2.6	-13	-65	-13 849	-2.8	229	-14 078	-13 927	216	-14 143
	Heredia	6	2.1	5	1	4 442	5.4	-2 265	6 707	4 448	-2 260	6 708
	Cartago	28	36.8	8	20	2 874	3.9	644	2 230	2 902	652	2 250
Ecuador, 2001	Quito	5 005	28.6	-592	5 597	18 198	3.0	-29 157	47 355	23 203	-29 749	52 952
	Guayaquil	3 068	23.9	31	3 037	41 068	4.3	11 609	29 459	44 136	11 640	32 496
	Cuenca	714	49.1	147	567	11 322	9.4	2 968	8 354	12 036	3 115	8 921
Guatemala, 2002	Guatemala City	10 666	14.4	-3 028	13 694	489	0.1	-28 459	28 948	11 155	-31 487	42 642
	Quetzalten	1 007	3.8	681	326	98	0.4	216	-118	1 105	897	208
	Escuintla	-152	-6.7	-9	-143	-2 556	-5.2	-561	-1 995	-2 708	-570	-2 138
Honduras, 2001	Tegucigalpa	-219	-12.7	-32	-187	11 671	3.2	1 218	10 453	11 452	1 186	10 266
	San Pedro Sula	181	3.7	-42	223	6 708	3.1	-11 439	18 147	6 889	-11 481	18 370
	La Ceiba	258	6.7	-10	268	1 089	2.1	203	886	1 347	193	1 154
Mexico, 2000	Mexico City	1 137	1.7	1 226	-89	-72 063	-1.0	17 596	-89 659	-70 926	18 822	-89 748
	Guadalajara	41	1.1	-46	87	-14 719	-1.0	-8 256	-6 463	-14 678	-8 302	-6 376
	Monterrey	1 965	52.9	-2	1 967	40 656	3.0	-148	40 804	42 621	-150	42 771
Panama, 2000	Panama City	8 101	67.7	161	7 940	74 220	14.5	5 979	68 241	82 321	6 140	76 181
	Colón	270	17.3	8	262	1 499	2.1	2 105	-606	1 769	2 113	-344
	David	651	62.2	287	364	266	0.5	5 402	-5 136	917	5 689	-4 772
Paraguay, 2002	Asunción	-219	-12.7	-32	-187	11 671	3.2	1 218	10 453	11 452	1 186	10 266
	C.del Este	88	200.0	11	77	-2 257	-2.4	-1 861	-396	-2 169	-1 850	-319
	Encarnación	4	20.0	-2	6	-3 592	-8.7	-1 213	-2 379	-3 588	-1 215	-2 373

Source: prepared by the author on the basis of special processing of census microdata.

^{a/} For a definition of metropolitan area, see the DEPUALC database available from www.eclac.cl/celade/depualc/.

^{b/} Population aged five and above, resident in the country five years before the census and with valid replied to questions about usual place of residence and place of residence five years previous

NOTES

¹ “Concentrated deconcentration” is typical of the processes of suburbanization or geographic expansion of the city (extended metropolitan area) and of the construction of so-called “diffuse cities”. This hypothesis will be discussed further in this paper.

² Argentina, Venezuela, Bolivia, Brazil, Chile, Ecuador, Guatemala, Mexico and Uruguay, which combined represent 75 per cent of the region’s population in 2000.

³ Simple correlation of 0.8116 (p-value < 0.01, according to <http://home.clara.net/sisa/signif.htm>).

⁴ Mega-cities are cities of 10 million or more inhabitants. In 2005, while the population of Latin America and the Caribbean represented 8.6 per cent of the world population, the region accounted for almost 30 per cent of the world’s mega-cities (United Nations, 2006).

⁵ The categories are: (a) “millionaire” cities (1 million or more inhabitants); (b) large intermediate cities (between 500,000 and 1 million inhabitants); (c) medium-sized intermediate cities (between 50,000 and 500,000 inhabitants); (d) small intermediate cities (between 20,000 and 50,000 inhabitants); and (e) small cities (with between 2,000 and 20,000 inhabitants). Countries considered in the table are: Argentina, Bolivarian Republic of Venezuela, Bolivia, Brazil, Chile, Ecuador, Guatemala, Mexico and Uruguay

⁶ The source for all calculations is the database on spatial distribution and urbanization in Latin America and the Caribbean (DEPUALC) (www.eclac.cl/celade/depualc). A reduced or shorter version of this database was published by CELADE, 2005. Some other calculations included in this document are based on detailed country archives that are not published or available online.

⁷ However, a cross-section analysis considering Latin American countries only shows that there is still a positive and statistically significant relationship between development and internal migration intensity; in fact countries that are less developed tend to have considerably lower levels of internal mobility (ECLAC, 2007). Future research should pay attention to this paradox between trends and cross-section analysis.

⁸ The net migration rate was based on replies to the question about administrative unit of residence in the five years before the census. The categories are: (a) attractive (positive net migration in both censuses); (b) displacing (negative net migration in both censuses); (c) rising (negative net migration in the first census and positive in the second); (d) falling (positive net migration in the first census and negative in the second).

⁹ One of the marginals corresponds to the attribute at the moment of the census, which incorporates the effect of actual migration, and the other marginal corresponds to the attribute with the territorial distribution it would have if migration had not occurred in the reference period. This is a comparison between a currently observed scenario and a counterfactual one. Key to the procedure is the constancy of the attribute over time (as in variables such as sex, for instance or variation common to the entire population (as is the case with age).

¹⁰ Of course, this analysis is not exhaustive. For instance, it does not take account the effects of remittances that, in some countries, are relevant in the case on internal migration.

¹¹ The other exception is Paraguay, where the question used suggests that the countryside gained over 60,000 people through internal migration in the period 1997-2002. These results have, however, been rejected by the very agency that carried out the census (Sosa, 2007).

¹² These estimates are orders of magnitude and not precise figures, as they are based on procedures that use fairly strong assumptions. They merely provide the net rural-to-urban migration balance by age and sex. These results tend to be overestimates, as they take migration to include the reclassification of areas (usually the upgrading of rural areas as urban ones as a result of population growth).

¹³ Intercensal survival methods apply observed survival ratios to the population at time t (say, the year in which a census took place) to obtain the expected population at time t+n (most often the year of the following census) in the absence of migration. A comparison between the expected and observed population at time t+n is taken as an estimate of net migration.

¹⁴ These percentages are compatible with other studies (United Nations, 2001). This finding does not rule out rural-to-urban migration being the driving force of urbanization given the greater natural increase in the countryside (ECLAC, 2007 and 2005a).

¹⁵ In the last two cases, the primacy index may be falling (see figure 1), while the concentration of the urban system in the two main cities may be rising.

¹⁶ There is a global trend towards increasingly large urban areas which, in some cases, can be described as mega-regions. Because of population growth, several cities and metropolitan areas combine into a large metropolitan (Sassen, 2007, p. 11)

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INTERNAL MIGRATION IN CHINA: TRENDS, GEOGRAPHY AND POLICIES*

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A. INTRODUCTION

China's economic success story in the last three decades cannot be separated from its plentiful supply of migrant labour from the rural areas in the hinterland to cities along the coast (Scott, 2006; Fallows, 2007). Despite the great interest by academics, the media and the public in general (Davin, 1999; Fan, 2008), the analysis of migration trends in China continues to be plagued by problems in interpreting statistics and by inconsistencies in key data over time (Goodkind and West, 2004; Liang and Ma, 2004). Also, the underlying concepts China uses to define migration flows are different from those used in other countries and are sometimes misinterpreted. As will be explained in the following sections of this paper, the analysis of internal migration patterns in China is further complicated by the particular institutional arrangements and systems of population and migration management, and of statistical reporting (Scharping, 2001; Chan, 2007). Because of the difficulties in obtaining complete information of migrant flows, Roberts (2002) refers to migrants as "invisible residents."

In order to provide a clear picture of recent migration trends and flows and the policies that impact them in China, this paper reviews and synthesizes data from a large number of sources, building on the previous works by Mallee (1998), Liu and Chan (2001), and Chan (2001; 2007). The first part tackles data issues and examines trends and patterns. The second part looks at two areas of policy importance to migration: migration and regional disparities; and migration and the reforms of the *hukou* system, aiming to contribute to a better understanding of the migration dynamics and complexities in China. The paper discusses the importance of internal migration in reducing regional economic disparities in the last two decades and recommends more reforms of the *hukou* system to help promote migration and protect migrants' rights.

B. THE HUKOU SYSTEM AND DEFINITIONS OF MIGRANTS

Any meaningful analysis of migration flows in China must begin by understanding the *hukou* (household registration) system and its relationship to migration. As is now well known, migration in China is highly regulated. People wanting to change residence permanently are required to obtain approval from the local authorities (Chan and Zhang, 1999; Chan and Buckingham, 2008). A change in residence is considered legal only if it is formally approved and registered with the public security authorities. For urban residents, changing *hukou* residence *within* the same city or town (i.e. "moving" the *hukou* to a new address) is generally permitted. Rural residents are also permitted to move *within* rural areas their *hukou* because of marriage or other family reasons. However, formal (or "permanent") moves crossing city, town and township boundaries, as will be explained below, are strictly regulated and require a "migration permit" issued by the public security authorities. The permit is granted only when there are

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good reasons for the proposed move and if the move serves, or at least is not at odds with, the central or local state interests and policies, such as those aimed at controlling the growth of large cities (Cheng and Selden, 1994; Mallee, 1995; Chan and Zhang, 1999). Generally speaking, it is very difficult for an ordinary person to obtain a migration permit for moves from rural to urban areas, or from smaller cities to larger cities (Wang, 2005a; Wu and Treiman, 2007). The *hukou* system in the pre-reform era functioned as a *de facto* internal passport system and a mechanism to distribute social goods; today, it still serves many similar latter functions, although peasants can now travel to many places to take up jobs or stay with relatives “temporarily” (i.e. without local *hukou*). Still, these peasants are ineligible for many benefits and rights, such as local social benefits, which ordinary local residents qualify for automatically.

Migrating from a rural to an urban area requires first changing one’s residency status from rural to urban, and then obtaining permission to move to a specific urban centre. The latter—obtaining the local *hukou*—is the final step in this process today (Chan and Buckingham, 2008). *Hukou* are distinguished from non-*hukou* migrants depending on whether or not local *hukou* is conferred in the move. Two categories of migrants can thus be defined (Chan and others, 1999):

- a. Migration with “local” residency rights (*bendi hukou*) (hereafter, *hukou* migration);
- b. Migration without *hukou* residency rights (non-*hukou* migration).

In China, officially, only *hukou* migration is considered *qianyi* (“migration”). Other types of moves are considered *renkou liudong* (population movements or “floating” population), implying a “temporary” move to a destination where the person is not supposed to (and is legally not entitled to) stay permanently. In the official statistics, persons in this category are classified as “temporary” movers, despite the fact that many non-*hukou* migrants may or may have been at the destination for years. *Hukou* migrants, on the other hand, are considered *de jure*, permanent residents and have the same legal status of the residents in the destination. *Hukou* migrants are eligible for the same array of social benefits and rights other local residents have. *Hukou* migration falls into the “planned” migration (*jihua qianyi*) category, whereas the floating population does not. From the Government’s point of view, the *hukou* and non-*hukou* distinction is the most important. Until recently, China’s main source of annual population statistics—generated by its *hukou* system—reported basically only the *hukou* (*de jure*) population. In recent years, statistics of the non-*hukou* population who are registered as “temporary residents” are also reported (Chan, 2007). In addition, in the last 25 years or so, researchers and statistical agencies also collected information on *hukou* and non-*hukou* migrants on a *de facto* basis through various sample surveys and population censuses. However, the large number of people moving internally as well as the circulatory and temporary nature of some of these flows in China enormously complicates the efforts to measure the movement accurately and to address its many implications.

Table 1 presents an overview of the internal migration flows at the national level in China based on data from different sources. Some of these data were collected at the destination; others at the origin (mainly villages). Despite the diversity and the varying quality of these data sets, when analyzed side by side, they show some notable consistencies, as explained next.

TABLE 1. MAJOR AGGREGATE MIGRATION FIGURES, 1982-2006 (IN MILLIONS)

Geographic boundary (to cross)	Hukou Migrants (Yearly flow figures)	Non-Hukou Population (Stock figures) or “Floating Population”					
		Accepted general estimates	“Temporary Population”			“Rural Migrant Labour”	
			Registered with MPS	National Censuses/ NBS Population Surveys		Data compiled by Lu and others (2002)	Estimates based on MOA Surveys
				Township, Town or Street	County or City		
City, Town, or Township						Generally, township	Township
Minimum length of stay	No minimum	Usually overnight	3 days	6 months	6 months or one year	Regularly engaged in work outside townships	
Series	A	B	C	D	E	F	G
1982	17.30	20			6.6 (1 yr)		
1984	19.69	20					
1987	19.73				15.2 (6 mos.)*		
1988	19.92	70				26.0	
1989	16.87					30.0	
1990	19.24				21.6 (1 yr)		
1991							
1992	18.70	60-70					52.8
1993	18.19	70				62.0	
1994	19.49					70.0	
1995	18.46	80		49.7	29.1**(6 mos.)	75.0	69.0
1996	17.51			60.0			
1997	17.85	100	37.3	61.8			
1998	17.13		40.5	62.4			79.8
1999	16.87	100	40.4	63.7			
2000	19.08		44.8	144.4			
2001	17.01		55.1	N/A			
2002	17.22		59.8	109.3			
2003	17.26	140	69.9	107.8			98.2
2004	19.49		78.0	106.6			102.6
2005	19.33		86.7	147.4			108.2
2006	20.60	150	95.3	128.7			114.9
2007	20.84		104.4	120.7			

Source: A: Ministry of Public Security (MPS) (1988-2006a); National Bureau of Statistics (NBS) and MPS (1988)

B: Figures for 1984, 1995 and 2006 are quoted by Yu (2008); others are compiled from various sources explained in Chan (2006). See more explanations in the text.

C: MPS (1997-2006b)

D and E: NBS (1988), State Council (SC) and NBS (1985; 1993; 2002; 2007, p.851), National Population Sample Survey Office (1997).

F: Lu and others (2002)

G: Ministry of Agriculture (2006a; 2006b).

* the geographic boundary is based on city, county or town.

** The geographic boundary is based on county-level units.

Hukou Migrant Series (A): This series refers to *hukou* migrants and is the only “flow” data series presented in table 1. The figures refer to the number of in-migrants who are formally granted *hukou* status in the destination (city, town and township) each year. These *hukou* migration figures are drawn directly from statistics published by the Ministry of Public Security (MPS) annually. They represent the total number of all officially approved changes in *hukou* (residence) within a particular year, from townships to cities; from cities to cities; from townships to townships, etc, excluding moves *within* cities, towns and *within* townships.² It is very likely that these numbers are tabulated from the records of migration certificates issued each year. Although these numbers are not without error, observers such as Mallee (1998), Liu and Chan (2001) and Yang (2003) generally consider that these numbers are reasonable indicators of *hukou* migration.

Non-*Hukou* Population Series (Series B-G): This series refers to the *liudong renkou* (“floating population,” sometimes also referred to as “floaters” in the English public media), defined as the people staying in an administrative unit (usually city, town, street, or township) other than their place of *hukou* registration. This “floating population” is not counted as *de jure* population, which leads to important discrepancies between the *de facto* and the *de jure* population counts in some cities, such as Shenzhen.³ Unlike the flow (*hukou*) migration data of Series A, the non-*hukou* population series presented in Table 1 are “stock” figures; i.e., the number of non-*hukou* migrants who reside in a certain locality at a given point in time. Owing to their different purposes, coverage and criteria used in defining the geographic boundary and the minimum duration of stay, the numbers for the floating population in each series may be expectedly quite different even for the same year.

Series B: This series is based on the broadest and most widely used definition of the floating population, which includes anyone without local *hukou* staying in the destination, regardless of the length of the stay⁴. The stay can be just as short as one night or for several years. As such, this series covers a very diverse group of people, such as tourists, people on business trips, traders, sojourners and peasant migrants, both employed and unemployed. These numbers, reported in the media, vary significantly, reflecting the rather unsystematic nature of this series. Some of the national figures are simply educated guesses, others are extrapolations made from sample surveys and rail passenger volume figures, and/or other more reliable series such as Series C-E (for an example of details, see Solinger (1999) Appendix). Series B shows some of the typical figures reported in the Chinese newspapers at certain points in time. Given their nature, such figures should be treated basically as rough and imprecise indicators of trends.

Series C: Unlike the preceding series, this is a systematic series of data on the “floating population” based on actual counts and a narrower definition. It is made available by the Ministry of Public Security (1997-2006b) since 1997. By law, anyone staying in places other than his/her place of household registration for three days or more is required to register with the police and apply for a *zanzhu zheng* (“temporary resident permit”). Consequently, this group is also categorized as “temporary population” (*zanzhu renkou*) by the police authorities. A large number of floaters fail to comply with this requirement (*Renmin Ribao*, 1995); this helps to explain part of the large discrepancies between Series B and C. Probably because of the floaters’ lack of official residence status in the destination and the logistical difficulties in tracking these people, there was no attempt made to count the floaters in the whole country until the 2000 Census. For a discussion of the problems encountered in counting these people in the Census, see Yu (2000) and Chan (2003).

Series D and E: These two series stem from one series published by the National Bureau of Statistics (NBS) that experienced some changes in definitions and coverage over time. The population is defined first on a *de jure* and then on a *de facto* basis. The *de facto* definition stipulates a far longer minimum residence requirement (6 months or one year) than in Series B and C. Therefore, Series D and E will show a smaller population than Series B even if the geographic boundaries in defining migration are the same. The NBS still calls this group *liudong renkou* (floating population). Elsewhere, it is termed “temporary population” or “temporary residents” by many researchers (for example, Yang, 1996), although this group’s stay is not necessarily “temporary” at all. However, it is true that tourists and shorter-term migrant workers are excluded. Yu Xuejun, a senior official of the National Family Planning Commission, has remarked that the floating population is staying longer in the destination in recent years (Yu, 2008). NBS has correctly treated this group as part of the *changzhu* population (“regular residents”) in statistical terms in its various recent reports; more recently, NBS even stipulated that the temporary population should be counted as part of the resident population for the calculation of per capita GDP at the local levels (Chan, 2007). The data for Series D and E are drawn from national censuses (1982, 1990 and 2000), the “mini-censuses” (1 per cent National Population Sample Surveys) of 1987, 1995 and 2005, and annual sample surveys from 1996 onwards conducted by the NBS at the place of destination. The

numbers in Series D are larger than those in series E even for the same year (such as in 1995) because D is based on smaller geographic units. The numbers in series D are larger because the population counts are defined on migration across smaller geographical/administrative units.

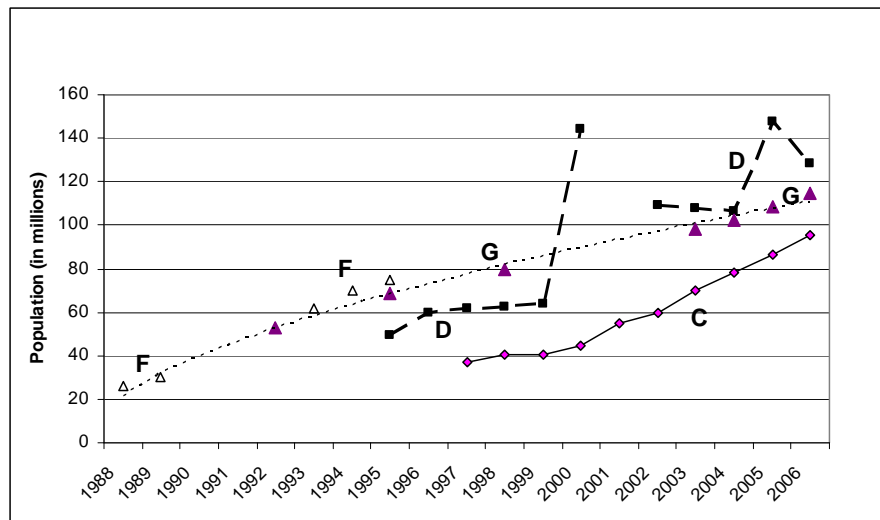
Series F and G: This series refers to a special group of migrants, generally known as “rural migrant labour” (*mingong*). This group includes only the working population from the countryside which is living without local *hukou* in the destination. By inference, it is basically a subset of the floating population. The figures are collected from sample surveys conducted in the rural areas. A majority of rural migrant labourers are unskilled or low-skilled workers (Liu and Hu, 1991). Some of these rural migrants are seasonal and are therefore prone to leave the countryside in the winter but return in spring. Since the rural migrant population started to grow, in the early 1990s, many large-scale national surveys of rural migrant labour have been conducted (Mallee, 1996). However, many of these surveys were only conducted once and are often not totally comparable among each other. The two series selected for table 1 are compiled from an established rural migration authority (Li and others, 2002) and from an annual national sample survey conducted by the Ministry of Agriculture based on relatively consistent definitions of migrants and geographical boundaries over time. The national rural migrant labour estimates are generally derived from the percentages of *mingong* generated from these sample surveys. The sample used by the Ministry of Agriculture covers about 300 villages and 7,000 households and the definition used is very close to the general concept of “*mingong*.” By this definition (Series G), there were about 100-115 million rural migrant labourers living in cities and non-cities in the country in the early twenty-first century. This series covers a longer time span (1992-2006) with greater internal consistency than other series. Another version of the total size of rural migrant labour in 2006, based on a similar but not exactly the same definition used in China’s second Census of Agriculture, is 132 million (Yu, 2008). The latest one, based on estimates done at 2008 year-end by the National Bureau of Statistics, is 140 million (Chan, 2010b).

C. MIGRATION TRENDS SINCE THE EARLY 1980S

Based on the figures presented in table 1, one can identify some broad migration trends. Despite the general increase in the number of migrants in the country over the last quarter century, the annual number of *hukou* migrants recorded by the Ministry of Public Security remained stable, between 17 and 20 million people between 1982 and 2006. In fact, the *hukou* migration rate has declined slightly, relative to the size of the Chinese population. An analysis of the detailed MPS (1993-2005a) figures shows that between 80 and 90 per cent of all *hukou* migrants since 1993 were recorded in urban areas. The stability of the number of *hukou* migrants and of the percentage in urban areas reflects strong government intervention in area of *hukou* migration across city, town and township boundaries, through mechanisms such as a quota control (Chan and Zhang, 1999).

On the other hand, as shown in table 1, the non-*hukou* migrant population has been growing since the early 1980s. Based on Series B, for instance, the floating population started to expand rapidly in the mid-1980s to about 70 million people in 1988 then dropped in 1989-1991 due to an economic austerity programme, which affected many of the destination areas, but migration regained momentum from 1992 to 1997, reaching 100 million people by 1997. The 2006 estimate is probably very close to 200 million people. Similarly, during 1992-2006, the number of rural migrant workers more than doubled from 53 million to 115 million (Series G). The general upward trend is also obvious in figure 1, which plots four series of non-*hukou* population statistics. It is also useful to note that the two rural migrant labour series (F and G) merge well to display a continuous upward trend in 1988-2006. Generally, the numbers and trends for the 1990s shown are consistent with those from other sources -see Yang (1996; 2004), Zhao (1998), Chan (2001) and Rozelle and others (1997). The *One Per Cent National Population Survey* in 2005 recorded 147.4 million people identified as “floating population” (Series D), and slightly more than half of them (86.7 million) were registered with the police in Series C.

Figure 1. Trends of Non-*Hukou* Migration, 1988-2006: Selected Statistics



Source: Table 1 (above)

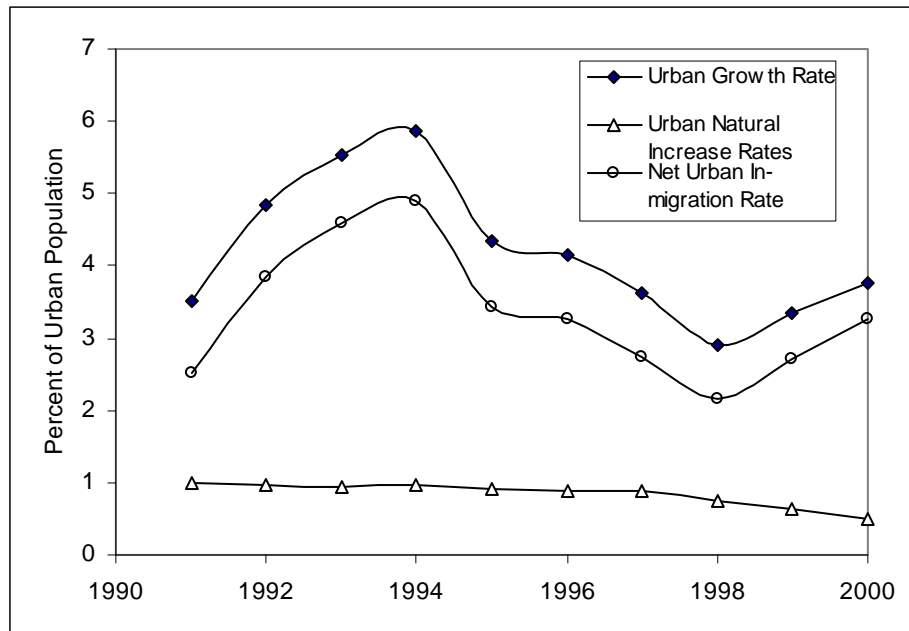
NOTES: The letters “C”, “D”, “F” and “G” refer to the respective Series in table 1.

“C” and “D” are “temporary migration” figures; “F” and “G” are “rural migrant labour”.

However, Series D shows some notable swings: two data points, 2000 and 2005, appear to be quite “out of the line,” given what statistics in other series have shown. The accuracy of 2000 and 2005 figures may be assumed to be good because they are from either a full census (2000) or a 1 per cent national sample (2005) while the rest are from annual one per 1000 sample surveys. However, earlier research (Chan, 2003; 2006) suggests that both the 2000 Census and the 2005 “mini-census” may have over-counted the number of migrants while the regular, annual one per thousand survey may have erred in the opposite direction (undercounting the migrant population). Therefore, a reasonable guess would be to put the true migration figures (Series D) somewhere in between those two sets of numbers. For example, the 2005 and 2006 figures for series D could be between 130 and 150 million.

The data show a slow growth in the number of migrants in 1996-99. This is most evident in series D, although the average growth rate of series G also declined to 4.8 per cent per year in 1995-1998, from 7.3 per cent per year in 1992-95. This slowdown in rural outflows may be due to: (1) the slow-down in the urban economy in this period, (2) job competition from laid-off workers of urban state-owned enterprises, (3) protectionist policies increasingly used by local governments against recruitment of outsiders, and (4) improvement in the rural economy, at least between 1996 and 1999 (Zhao, 1998; Cai and Chan, 2000). The slow migration growth in the second half of the 1990s is in line with the general rural-urban migration trends identified by Chan and Hu (2003), as shown in figure 2, and by Cai (2002), because rural-urban migration made up a large proportion of the rural migrant labour flows in the 1990s.

Figure 2. Annual urban growth and migration rates



Source: See Chan and Hu (2003).

NOTE: estimates based on an adjusted annual series of urban population figures. Net urban in-migration includes urban reclassification, which was more significant in the first half of the 1990s than in the second half.

D. THE GEOGRAPHY OF MIGRATION

Labour migration flows are closely linked to significant disparities in wages between the urban and rural sectors and between regions in China (Chan, 1994; Cai, 1999; 2000; Fan, 2005a). As pointed out earlier, in the last 25 years, the majority of migrants were predominantly non-*hukou* migrants from the rural areas. The lack of sufficient gainful employment in the countryside in many agricultural provinces is the main reason why rural workers have left the countryside. Because of the serious institutional barriers, the rural and urban populations and the respective labour markets operate as two largely separate rural and urban *hukou*-based “circuits” (Chan and others, 1999). The choice for rural migrant workers is largely limited to a farm job (or no job) at home or a low-level job in the cities. Rural migrant workers move across counties or even provinces to make monetary gains through employment and small family enterprises. These moves nearly balance the wage and living cost differentials of individuals between the origin and the destination. Most of them go to nearby towns outside the villages and about a quarter to one third moves to big cities on the coast.

The 1990 and 2000 censuses and the *One Per Cent National Population Surveys* in the inter-censal periods (1987, 1995, and 2005) provide useful data to study the geographic patterns of the migration flows in China in recent years. A “migrant” is defined as a resident of more than six months or one year in an administrative unit, who lived in a different administrative unit five years earlier and who is aged 5 or above at the time of enumeration. A summary of the aggregate five-year *flow* figures are presented in table 2. Non-*hukou* migrant *stock* data are also found in the censuses from 1982 and all the inter-censal surveys, as have been shown in Series D and E in table 1. It is important to point out that the 2000 and 2005 data define migrants as those crossing township-level units while the 1990 and 1995 data define migration only as a move between county-level unit boundaries. The 1995 survey reports a total of

33.23 million migrants crossing county-level units in the preceding five-year period. Seventy-two per cent of the inter-county migration was within provinces; the remaining 28 per cent (9.2 million people) were inter-provincial migrants (NPSSO, 1997).

TABLE 2. FIVE-YEAR MIGRATION FLOW FIGURES FROM CENSUSES AND MINI-CENSUSES, 1982-2005 (IN MILLIONS)

Year of Census or Survey	Five-year period	Minimum length of stay for non-hukou migrants	Geographic boundary	Total volume	Hukou Migrants	Non-hukou Migrants
1987	1982-87	6 months	County- and town-levels	30.44	20.5*	10.0*
1990	1985-1990	1 year	County-level	33.84	18.3*	15.8*
1995	1990-1995	6 months	County-level	33.23	N/A	N/A
2000	1995-2000	6 months	Township-level	124.7	43.0*	80.3*
			Of which:			
			Rural to urban	50.32*		
			Urban to urban	45.70*	N/A	N/A
			Rural to rural	22.52*		
			Urban to rural	4.69*		
		6 months	County-level	69.30*	N/A	N/A
2005	2000-2005	6 months	Province-level	38.04	N/A	N/A

Sources: National Bureau of Statistics (1988), State Council and National Bureau of Statistics (1993; 2002; 2007), National Population Sample Survey Office (1997), and Yan (1998).

NOTE: * Tabulated from 1 per cent microdata of the respective survey or census.

By 1995-2000, the volume of migration had increased substantially. Based on the same definition of *inter-county* migration, the volume of migration flows was reported to have doubled from 1990-1995 to 1995-2000, though the number of migrants in the 2000 Census was likely to be over-counted. Using microdata from the 1 per cent 2000 Census, one can also classify and estimate the flows by rural/urban origin and destination. The predominant flow during 1995-2000 was from rural to urban areas (50.32 million people), followed by urban to urban flows (45.70 million people) (table 2). The intra-urban flows include a large portion of “residential mobility” within cities.⁶ Tables 3 and 4 and figures 3 to 6 show *inter-provincial* migration in three consecutive five-year periods starting in 1990. The total volume of inter-provincial migration has increased significantly since 1990, from only 9.2 million people in 1990-1995 to 38 million people in 2000-2005 (table 4). The different definitions and procedures used for collecting the data by successive sources account for a small part of the increase; the remaining growth can be considered to be real. Inter-provincial migration accounted for an increasing share of all inter-county moves during 1990-2005 (table 3), from only 27.6 per cent in 1990-1995 to about 44.2 per cent in 1995-2000. Such increase is likely to continue in the early twenty-first century.

Figures 3 to 5 show the largest 30 inter-provincial migration flows for the periods 1990-1995, 1995-2000 and 2000-2005. The flows are directed primarily towards coastal provinces such as Guangdong and the Changjiang Delta. Table 3 provides more detailed information on inter-provincial in-, out- and net-migration flows by province, ranked by net migration volume. Scatter plots of the in-migration and out-migration figures by province show that major flows between provinces are basically unidirectional (figure 6). In other words, some provinces, such as Guangdong, are net destinations and others such as Sichuan, are net origins of inter-provincial migration flows. As such, the “net percentage” (NET percentage in table 3), that is, the net migration in each province as a percentage of total migration is a useful gauge of the relative share of the individual provinces in inter-provincial migration (table 3).

Analysis of the inter-provincial migration flows is also indicative of the changes in the spatial economy, especially in relation to the demand and supply of low-skilled labour. Table 3 shows that these

long-distance flows were primarily directed toward the coastal provinces in the first and second half of the 1990s with a further concentration of these flows in 2000-2005 (see Ding and others, 2005). Based on the indicator “net percentage,” Guangdong was *the* preferred destination of inter-provincial migrants for the period 1990-2005. At its peak, this province’s net migration accounted for about one third of the nation’s total inter-provincial migration in 1995-2000. Shanghai came second, although its share was only 6.2 per cent. In other words, at the receiving end, there was significant concentration of flows into one province. In contrast, Sichuan was the largest net exporter of migrants over the period 1990-2005, accounting for -8.4 to -14.1 per cent of the nation’s total inter-provincial migration. Overall, in relative terms, the net outflow from Sichuan was less pronounced over time (partly because Chongqing had split from the Sichuan province in 1997). More importantly, by 2000-2005, the share of total migration from the second, third and fourth largest net population exporters (Anhui, Henan and Hunan) was almost the same as Sichuan’s (-7.4 to -8.3 per cent). In other words, in those 15 years, while there was a convergence of the inter-provincial migration flows into one (or two) provinces, origins of these flows became more diverse. This observation is consistent with the patterns shown in the migration flow maps in figures 3 to 5. The changes seem to reflect the intensification of regional industrial restructuring beginning in the late 1980s, whereby inland provinces lost proportionally more manufacturing jobs to the coastal provinces in the second half of the 1990s and onwards (Yang, 2004), giving rise to the emergence of Guangdong as the “world’s factory” by the early twenty-first century. At the same time, many more poor provinces (both their governments and people) have actively pursued population out-migration as an economic strategy in the last ten years, similar to that used by Sichuan back in the late 1980s. This greater geographic spread of economic migration and the longer distances migrated were also documented by Skeldon (1990) for the case of Peru, in what he called the “diffusion” of migration.

A further examination of table 3 shows that the relative rankings of the provinces remain quite stable in the three periods under study, with the exception of the dramatic reversal of Zhejiang from a net exporter in 1990-95 to the second largest net importer in 2000-2005. In the early 1990s, migrants from Zhejiang were almost everywhere in the country but the high growth of the provincial economy since the mid-1990s turned it into a major destination of migrants in the early years of the twenty-first century. Two other points are also worth noting: (1) while most provinces have been overwhelmingly importers or exporters over the recent past, there are some notable exceptions where in-migration and out-migration were more balanced. These are Jiangsu, Fujian, Shandong, Hubei, Hebei and Zhejiang in 1990-1995; Jiangsu, Shandong and Hebei in 1995-2000, and only Shandong and Hebei in 2000-2005. Over time, the number of such provinces declined, supporting the argument that there was increasing provincial economic specialization of labour in the last 15 years; (2) in spite of it being the largest net importer of labour, Guangdong registered a noticeable amount of gross out-migration (1.7 million people) in 2000-2005, often directed towards provinces of origin of the in-migrants, such as Hunan and Jiangxi. This out-migration is more likely a return migration than a diversion of migrant labour from Guangdong to other coastal provinces,⁷ but it constitutes a new trend with its own policy implications.

TABLE 3. INTERPROVINCIAL MIGRATION IN CHINA, 1990-2005 (IN THOUSANDS)

Rank	1990-1995	Migration			NET %	Rank	1995-2000	Migration			NET%	Rank	2000-2005	Migration			NET%
		In	Out	Net				In	Out	Net				In	Out	Net	
1	Guangdong	1 886	87	1 799	19.6	1	Guangdong	11 501	438	11 063	34.3	1	Guangdong	11 996	1 715	10 281	27.0
2	Shanghai	666	56	610	6.6	2	Shanghai	2 168	163	2 005	6.2	2	Zhejiang	5 062	1 041	4 021	10.6
3	Beijing	658	53	606	6.6	3	Zhejiang	2 715	970	1 745	5.4	3	Shanghai	3 025	375	2 650	7.0
4	Xinjiang	498	61	437	4.8	4	Beijing	1 890	174	1 715	5.3	4	Jiangsu	3 290	1 328	1 963	5.2
5	Jiangsu	748	430	319	3.5	5	Xinjiang	1 142	217	925	2.9	5	Beijing	2 246	330	1 916	5.0
6	Liaoning	371	122	248	2.7	6	Fujian	1 346	625	722	2.2	6	Fujian	1 934	802	1 132	3.0
7	Tianjin	206	35	171	1.9	7	Jiangsu	1 908	1 241	667	2.1	7	Tianjin	908	107	802	2.1
8	Nei Mongol	324	165	159	1.7	8	Tianjin	492	104	388	1.2	8	Xinjiang	577	182	395	1.0
9	Yunnan	231	127	104	1.1	9	Liaoning	755	380	375	1.2	9	Liaoning	674	416	257	0.7
10	Fujian	297	194	104	1.1	10	Yunnan	733	398	335	1.0	10	Hainan	191	158	33	0.1
11	Shanxi	165	79	87	0.9	11	Hainan	218	130	88	0.3	11	Ningxia	74	68	7	0.0
12	Hainan	91	54	38	0.4	12	Shanxi	383	334	49	0.2	12	Tibet	26	31	-6	0.0
13	Tibet	34	6	27	0.3	13	Ningxia	129	87	41	0.1	13	Qinghai	74	85	-12	0.0
14	Qinghai	64	47	17	0.2	14	Tibet	71	35	35	0.1	14	Nei Mongol	394	417	-23	-0.1
15	Ningxia	44	40	4	0.0	15	Shandong	904	878	26	0.1	15	Yunnan	469	601	-132	-0.3
16	Shandong	347	357	-9	-0.1	16	Qinghai	77	123	-46	-0.1	16	Shanxi	210	345	-135	-0.4
17	Shaanxi	147	172	-25	-0.3	17	Hebei	770	872	-102	-0.3	17	Shandong	924	1 123	-199	-0.5
18	Hubei	246	291	-44	-0.5	18	Nei Mongol	325	441	-116	-0.4	18	Jilin	218	532	-315	-0.8
19	Hebei	354	427	-74	-0.8	19	Jilin	254	529	-275	-0.9	19	Gansu	118	494	-376	-1.0
20	Gansu	102	178	-77	-0.8	20	Shaanxi	423	719	-296	-0.9	20	Hebei	612	990	-378	-1.0
21	Guizhou	181	288	-107	-1.2	21	Gansu	204	561	-357	-1.1	21	Shaanxi	255	827	-572	-1.5
22	Jilin	126	260	-134	-1.5	22	Heilongjiang	301	940	-639	-2.0	22	Heilongjiang	195	1 020	-825	-2.2
23	Heilongjiang	307	495	-188	-2.0	23	Chongqing	448	1 103	-655	-2.0	23	Chongqing	427	1 437	-1 010	-2.7
24	Zhejiang	345	618	-273	-3.0	24	Guizhou	261	1 232	-970	-3.0	24	Guizhou	531	1 766	-1 235	-3.2
25	Jiangxi	96	443	-347	-3.8	25	Guangxi	287	1 838	-1 551	-4.8	25	Guangxi	397	2 123	-1 726	-4.5
26	Guangxi	82	532	-450	-4.9	26	Hubei	606	2 210	-1 604	-5.0	26	Jiangxi	499	2 476	-1 977	-5.2
27	Henan	166	680	-514	-5.6	27	Henan	470	2 309	-1 839	-5.7	27	Hubei	501	2 715	-2 214	-5.8
28	Hunan	134	666	-532	-5.8	28	Jiangxi	236	2 681	-2 445	-7.6	28	Hunan	501	3 328	-2 827	-7.4
29	Anhui	101	762	-662	-7.2	29	Anhui	313	2 893	-2 579	-8.0	29	Henan	280	3 433	-3 154	-8.3
30	Sichuan*	171	1 465	-1 294	-14.1	30	Hunan	363	3 261	-2 899	-9.0	30	Anhui	671	3 836	-3 165	-8.3
						31	Sichuan	590	4 396	-3 806	-11.8	31	Sichuan	763	3 941	-3 178	-8.4
Total		9 189	9 189	0				32 282	32 282	0				38 042	38 042	0	
Inter-Provincial Migration as % of all inter-county migration		27.6						44.2						N/A			
Top 5 coastal provinces		4 329	748	3 582	39.1			19 412	1 962	17 454	54.1			25 619	4 789	20 830	54.8

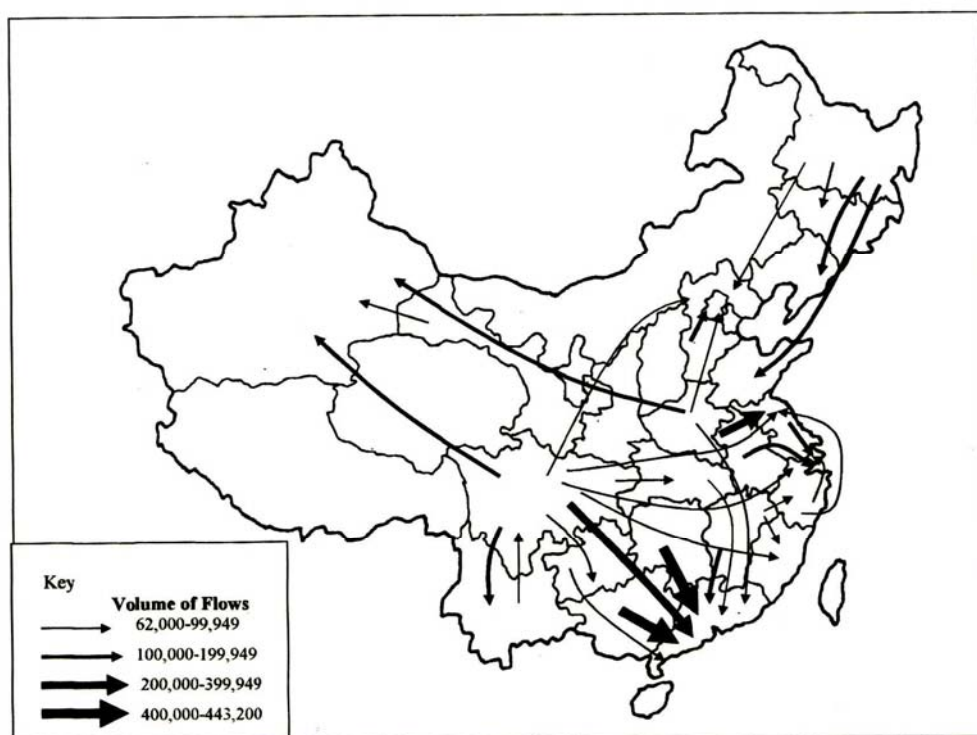
Sources: NPSSO (1997), SC and NBS (2002, 2007) NOTE: NET% = Net migration /National total of in-migration x 100%; * including Chongqing.

TABLE 4. INTER-PROVINCIAL MIGRATION, 1990-2005

(a) Migration from another province (Migration flows)			
Period	Total (in millions)	As a percentage of national population at the beginning of the period	Increase over the previous 5 years (in millions)
1990-1995	9.2	0.81	
1995-2000	32.3	2.61	23.1
2000-2005	38.0	3.00	5.7

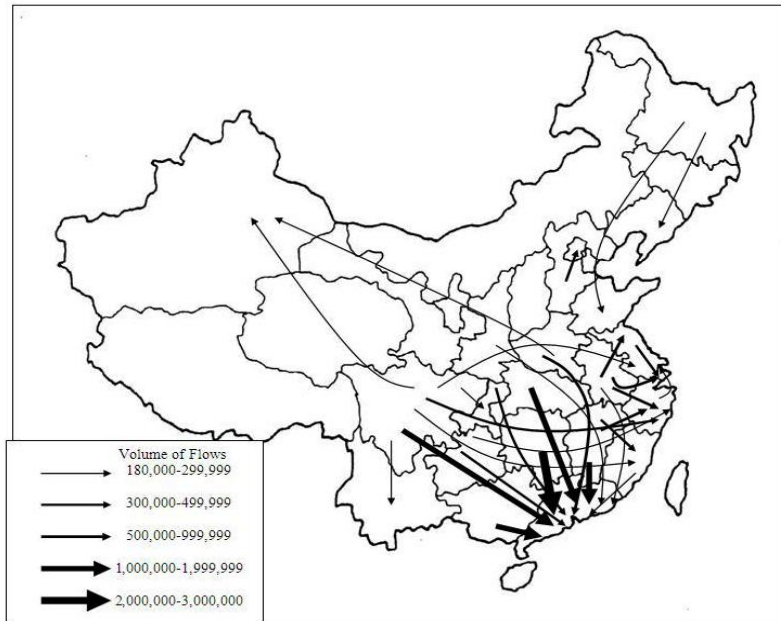
(b) Population with hukou in another province (Migrant stock)			
Year	Total (in millions)	As a percentage of national population	Increase over previous 5 years (in millions)
1995	9.3	0.75	
2000	42.4	3.35	33.1
2005	47.7	3.65	5.3

Source: National Population Sample Survey Office (1997); State Council and National Bureau of Statistics (2002; 2007).

Figure 3. The 30 largest inter-provincial migration flows, 1990-1995

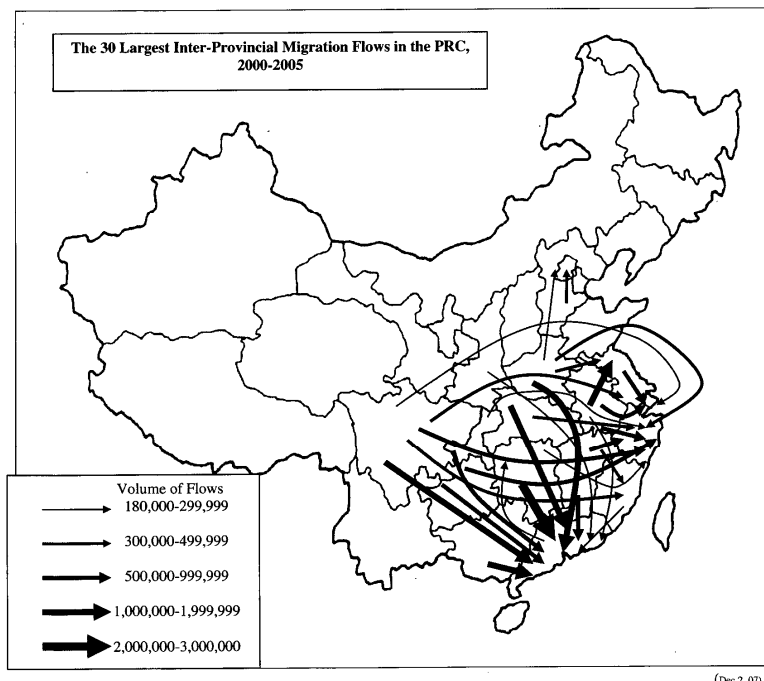
Source: National Population Sample Survey Office (1997)

Figure 4. The 30 largest inter-provincial migration flows, 1995-2000



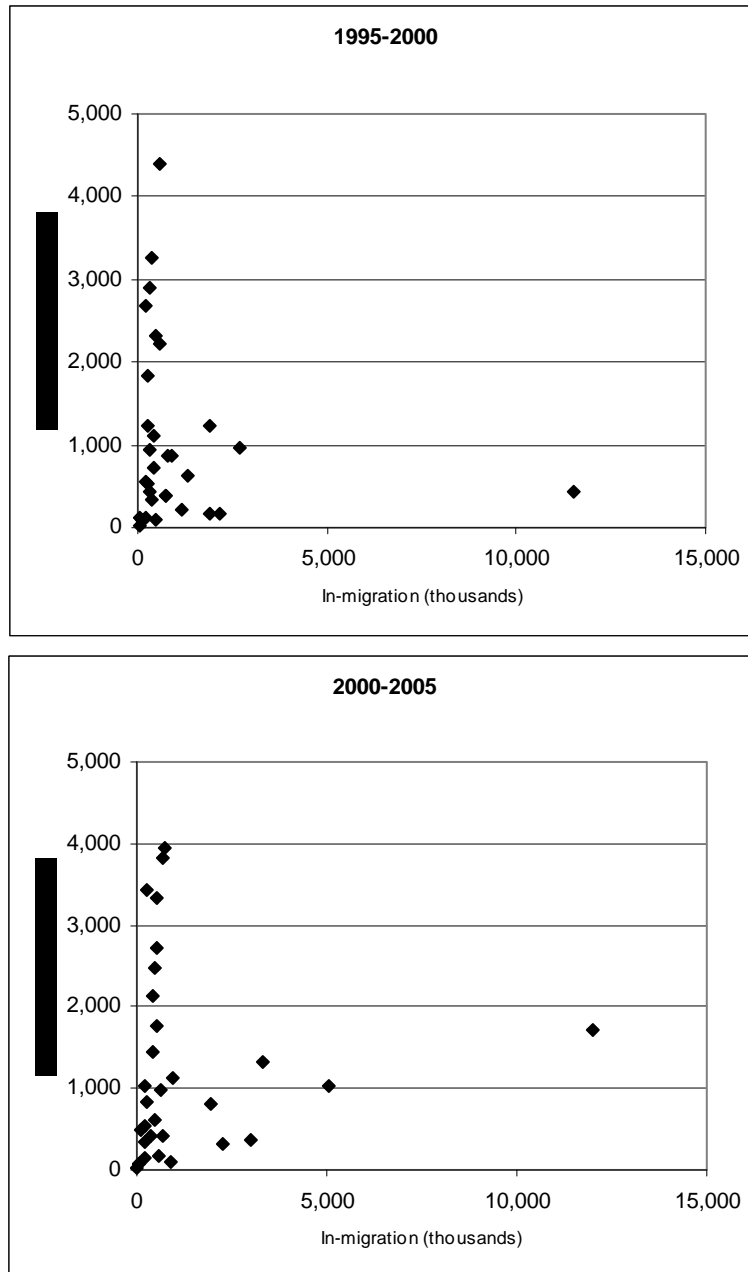
Source: State Council and National Bureau of Statistics (2002).

Figure 5. The 30 largest inter-provincial migration flows in the PRC, 2000-2005



Source: State Council and National Bureau of Statistics (2007)

Figure 6. In-migration and out-migration by province, 1995-2005



Data from national surveys conducted by various government departments and research institutions on rural household/labour provide also useful and often direct, information about the rural migrant labour in China (Mallee, 1998). Because rural migrant labour, defined on the basis of the *hukou* status of migrants, is a unique Chinese phenomenon, some of the “migration” statistics compiled do not adhere to “standard” migration definition. The national estimates are derived from large sample surveys which were conducted at different times and often using different definitions of “rural migrant labour.” As mentioned above, these surveys cover labour migration from the countryside *regardless* of a migrant’s

length of stay at the destination. Therefore, they capture more comprehensively all labour migrants, unlike the census data which exclude migrants staying in the destination less than six months or a year. Also, these survey data provide *stock* measures of migrants, as opposed to the census and mini-census migration flow data examined earlier.

Tables 5 and 6 present rural migrant labour data classified by geographical area and origin and destination from three separate major national sample surveys undertaken between late 1993 to early 1994, 1998 and 2004. According to the 1993/94 survey, the number of rural migrant workers who participated in work “outside” the village, including for seasonal labour, reached 51 million people in 1993-1994, accounting for about one eighth (12.5 per cent) of the country’s rural labour force (table 5). These flows of rural migrant labour were directed predominantly toward urban areas (77.9 per cent).

According to the same 1993/94 survey and using the common three-region division⁸ of China, the Central region was the most important source of rural migrant labour, with the highest labour out-migration rate (15.9 per cent) and the largest number of migrants (22.8 million people) (see table 5 Panel A). It was followed by the West region, with a 13.5 per cent migration rate and 15.4 million migrants. The East region had a migration rate of 8.5 per cent and the smallest volume of migrants. This pattern is generally consistent with the findings of other studies of the early and mid-1990s (such as Rozelle and others, 1997). Because of the large size of the population and labour force in the Central provinces, the Central region accounted for 44 per cent of the estimated total outflows. The low rate of out-migration in the East region is attributed to the high level of development of rural non-farm enterprises in many villages and townships, which absorbed local and nearby rural labour. This is not the case for the Central or West regions. A significant part of the *mingong* (rural migrant labour) movement was intra-county migration (36 per cent) and a very large share of all *mingong* migrants (71 per cent) moved within the provinces of origin. A similar survey taken 11 years later (2004) shows that the overall rural labour out-migration rate had almost doubled to 23.8 per cent (table 5 Panel B). In terms of the regional distribution of the rural migrant labour, while the Central region still had the lion’s share in 2004, the East region had more in-migrants than in the West region. Migrant labourers from rural areas were overwhelmingly found in cities and towns (94.3 per cent), with about two-thirds of them ended in large- and medium-sized cities (cities above the county-level).

TABLE 5. COMPOSITION OF RURAL MIGRANT LABOUR, 1993 AND 2004

Region	Total rural labour (in millions)	Number of migrants (in millions)	Migrants as a share of rural labour (percentage)	Regional share of all migrants (percentage)	Geographic distribution of migration (percentage)				
					Within Counties	Within Provinces		Toward Urban Areas	
(A) 1993/94									
East	154.5	13.1	8.5	25.6	28.4	66.3		82	
Central	143.3	22.8	15.9	44.4	40.6	70.4		83.3	
West	113.8	15.3	13.5	30	37	76.4		66.5	
TOTAL	411.6	51.2	12.5	100	36.4	71.1		77.9	
(B) 2004									
East	198.7	39.3	19.8	33.3	Province-level cities and provincial capitals	Prefecture-level cities	County-level cities	Designated towns	Others
Central	173.8	47.3	27.2	40					
West	124.4	31.6	25.4	26.7					
TOTAL					28.1	34.3	20.5	11.4	5.7

Source: Li (1994) and National Bureau of Statistics Survey Group (2006).

NOTES: Rural migrant labour refers to rural workers who had been outside the townships for work in that year.

Classification of Regions:

East = Liaoning, Beijing, Tianjin, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, Guangxi and Hainan.

Central = Heilongjiang, Jinin, Nei Mongol, Shanxi, Henan, Anhui, Hubei, Hunan and Jiangxi.

West = Xinjiang, Qinghai, Gansu, Ningxia, Shaanxi, Sichuan, Guizhou, Yunnan and Tibet.

A comparison of data for 1993 and 1998 shows that the stock of rural migrant labour remained at about 50 million (table 6 A). While within-county migration stayed fairly stable (at 17-18 million people, or between 34 and 36 per cent), there was a significant increase in the number of migrants moving to other provinces, mostly in other regions, between 1993 and 1998. In 1998, inter-provincial and inter-regional migrants accounted for 31 per cent of the total rural migrant labour stock, compared to only 18 per cent in 1993. This means that the rural migrants moved to more distant destinations, a finding consistent with results from the 1995 mini-census and 2000 Census data in table 3, which evidenced large increases in the number of migrants crossing provincial boundaries.

Another regional comparison of the inter-provincial migration flows between 1993 and 1998 in table 6(B) shows that the Central region has further consolidated its role as the most important origin of rural migrant labour crossing provincial boundaries (55 per cent in 1998 compared to 46 per cent in 1993), and the East region has become the primary destination of inter-provincial rural migrant labour (increased from 70 per cent to 83 per cent). Inter-provincial rural migrant labour out of the West region witnessed the most rapid growth, with its share rising from about one-quarter to one-third during that five year period. The share of inter-provincial rural migrant labour out of the East region, however, declined from about 30 per cent in 1993 to only about 11 per cent in 1998 of the total inter-provincial rural migrant labour during that period.

The regional flow matrix in table 6 B also shows that the majority of the inter-provincial rural labour migrants in the East region stayed within the region (more than 70 per cent) throughout the 1990s. In addition, the proportion of inter-provincial migrants from the Central and West regions to the East

region increased between 1993 and 1998 (from 79 per cent to 87 per cent in the case of the Central region, and from 52 per cent to 79 per cent in the West region). This regional outflow pattern shows that migrants from the West region followed in the footsteps of migrants from the Central region. In 1993, a substantial portion of out-of-province rural migrant workers from the West region moved within the same region (38 per cent). In 1998, however, a much smaller percentage did (15 per cent), while more than three-quarters of them moved to the East region. It has been argued that those moves outside the region of origin would help to narrow the spatial wage disparities (Cai, 1999) (See also discussion in the next section).

Table 6C shows a comparison of rural labour migrant flows within and between provinces for 1998 and 2004. The table confirms that the East region has become much more attractive to rural labour migrants over time, accounting for 70 per cent of migrants from all three regions in 2004, compared to only 38 per cent in 1998. Not only did an increasing number of rural migrant workers stay in the East region during this period, but the two net exporting regions (Central and West) also sent more migrants to the East region in both absolute and relative terms.

TABLE 6 (A). DISTRIBUTION OF RURAL MIGRANT LABOUR, 1993 AND 1998
WITHIN-PROVINCE MIGRATION AND INTER-PROVINCIAL MIGRATION

	1993		1998	
	Within-province migration			
	Total (millions)	Percentage	Total (millions)	Percentage
Within Counties	18.66	36.4	17.18	34.9
Outside Counties	17.82	34.8	13.46	27.3
Total within-province migration	36.48	71.1	30.64	62.2
	Inter-provincial migration			
	Total (millions)	Percentage	Total (millions)	Percentage
IPM Within Region	5.83	11.4	3.24	6.6
IPM Outside Region	8.97	17.5	15.38	31.2
Total inter-province migration	14.8	28.9	18.62	37.8
Total	51.28	100	49.26	100

TABLE 6(B). REGIONAL DISTRIBUTION OF INTER-PROVINCIAL RURAL MIGRANT LABOUR, 1993 AND 1998

		Origins			
Destinations		East	Central	West	All
1993	% of IPM	29.9	45.6	24.5	100
East		71.4	79.2	52.2	70.3
Central		21.8	18.9	9.4	17.4
West		6.8	1.9	38.4	12.3
All IPM (=14.8 million)		100	100	100	100
1998	% of IPM	11.0	55.0	34.0	100
East		72.7	87.3	79.4	83.0
Central		18.2	9.1	5.9	9.0
West		9.1	3.6	14.7	8.0
All IPM (= 18.6 million)		100	100	100	100

TABLE 6(C). REGIONAL DISTRIBUTION OF RURAL MIGRANT LABOUR, 1998 AND 2004 (PERCENTAGE)

Destinations	Origins			
	East	Central	West	All
1998				
East	89.9	32.3	29.4	37.7
Central	6.7	66.3	2.2	37.9
West	3.4	1.3	68.4	24.4
All Migration (= 49.3 million)	100	100	100	100
2004				
East	96.6	65.2	41.0	70.0
Central	2.1	32.8	2.9	14.2
West	0.8	1.8	55.8	15.6
All Migration (=118.2 million)	100	100	100	100

Sources: Li (1994), Liu (2000), Sheng and Pang (2006).

NOTES – WPM = Within-province migration; IPM = Inter-provincial Migration

See notes in table 5 for classification of regions.

E. RECENT POLICIES

Social, economic and political factors influence migration flows while at the same time, migration affects the social, economic and political situation. This observation applies to China as well as many other countries in the world. This section looks at some of the Government's policies and actions regarding economic disparities in the country, their links to migration and the *hukou* system. A major concern of the central government is the wide economic gaps between the coastal and the inland regions. Most of the existing studies on long-distance (inter-provincial) moves examine the effect of regional economic disparities on migration and show that the widening (mainly economic) regional inequalities in the 1990s have led to an increase in the number of people moving over long distances (Chan and others, 1999; Cai and others, 2001; Lin and others, 2004; Fan, 2005a; 2005b). Indeed, some have argued that China experienced a continuing rise in inter-provincial disparities *despite* the extraordinary increase in geographic mobility in that period. Chan and Wang (2008) have demonstrated that the previously observed widening regional economic disparities for 1995-2000 were based on incorrect *de jure* provincial population series, which overstated the inter-provincial inequalities of 2000. They have shown that China's regional economic disparities, as measured by an inequality index (coefficient of variation), began to level off in the mid-1990s and have remained large but unchanged since then (see also Tsui, 2007).

Most probably, this levelling off of regional income inequality in the 1990s was related to the numerous programmes and efforts such as the introduction of new tax reforms in 1994 to increase the central government's redistributive capacity (Wong, 1997) and the massive "Western Development Programme" of 1999 that consisted of large investments in infrastructure and fiscal policies more favourable to the West region. As a result, basic education was made available in many poor provinces, as data gathered by UNDP (1999) and Chan and Wang (2008) have shown. Equally important, this narrowing inequality came as an outcome of the rapidly increasing rural labour mobility in that period, as has been examined earlier (see also Yang and Cai, 2003). The rapid increase in basic education in many poor provinces may have paved the way for faster development in those provinces later, partly by

facilitating especially long-distance migration (more feasible for those individuals with some education). Migration also greatly reduced the population pressure on land in the poor provinces, and offered opportunities of better-paid employment, raising incomes in the origin provinces, and the accumulation of job skills, as documented in China and other less developed countries (Ma and others, 2004; UNDP, 2005).

There are two types of policies regarding the *hukou* system that influence migration flows in China: those affecting *hukou* conversions (i.e. granting local *hukou* to migrants) and those that improve the living conditions of non-*hukou* migrants (those still without local *hukou*). Conversions of *hukou* have received much attention by policy-makers, academics and the public in the last 20 years. The *hukou* has been the main mechanism of institutional exclusion and discrimination in China (Chan, 1994 and Wang, 2005a). In recent years, there have been numerous news reports about China abolishing the *hukou* system (see Zheng, 2005; Reuters, 2005; Kahn, 2005). But Chan and Buckingham's (2008) have shown that many changes in the *hukou* system since the late 1990s have had only a marginal impact on the system (Wang, 2005a; Chan and Buckingham, 2008). The system continues to separate two segments of population (loosely, rural and urban) and generate discrimination based on that separation. The *hukou* system, directly and indirectly, continues to be a major barrier for peasants to move and settle in cities.

In recent years, the administration of the *hukou* system has changed, as local governments have been permitted to grant *hukou* status, whereas in the past only the central government was allowed to do so. Thereby, the central government no longer controls the quotas that allow only a pre-determined number of people to change *hukou* and move from one *hukou* status to another. The local governments have used their new powers to attract the very rich, the highly educated, people who are perceived to be able to make significant economic contribution to the city economy, and people who have immediate family members (usually spouses and children) living in the cities. Some other cities have experimented with schemes to allow some lower-skilled migrant workers to acquire city *hukou* (Shijiazhuang in the Hebei province being the most famous example), but these schemes have been very limited in scope and have been withdrawn after being briefly implemented. For the majority of poor rural labour migrants, the chances of obtaining city *hukou* have not improved under these new initiatives, as the admission criteria set by local governments are generally beyond the reach of ordinary peasant migrants. Chan and Buckingham (2008) have found that new entry conditions under the more "entrepreneurial" approach of local (city) governments have actually reduced the chances of poor migrants obtaining local *hukou* in cities.

Regarding policies and measures taken to improve working and living conditions of non-*hukou* migrants, the following, based mainly on Chan and Buckingham (2008), provides a summary of what have been accomplished in recent years and the continuing problems:

1. In early 2000, several provinces and cities such as Guangdong, Beijing, Shanghai, and Xiamen started to set up social security schemes to cover rural labour migrants. By the end of 2005, about 14 million people, out of more than 100 million rural migrant workers, had joined some form of paid pension scheme. According to a large survey of the National Bureau of Statistics in 2006, about one third of all rural migrant workers had some accidental injury insurance coverage. In general, the participation rate and coverage in these schemes are low, much lower than those in those for urban workers (Du and Gao, 2005). There are also serious questions whether the pension schemes for migrants would really work, or they are simply "schemes" to benefit local government coffers instead: since all those schemes are not portable and require a participant to have

stayed in one locale for 15 years to be eligible for benefits, and most migrants are highly mobile, it is for sure that many migrants will not be eligible when they retire (Chan, 2010b).

2. A major policy document issued by the State Council in May 2001 stipulated that local governments should provide nine years of compulsory education to migrant children through the public school system. Until the end of 2006, only a few local governments have actually implemented this policy of accommodating migrant children in public schools (Liang, 2006). Some districts in cities like Beijing have followed this directive. According to one report, 62 per cent of Beijing's 370,000 migrant children were admitted to public schools in 2006, but still another 25 per cent of them were enrolled in unauthorised schools. Also, other serious problems remain: migrant children often have to pay a school fee several times higher than local residents, and a significant portion of the migrant children attend sub-standard schools, or are not enrolled in school at all.
3. In 2003, prompted by the death of a migrant college student caused by police brutality in Guangzhou because the migrant did not have a proper resident identification, the Chinese National People's Congress passed a law taking away the police powers of detaining those failing to produce a valid resident identification. This was aimed at better protecting migrants from this kind of egregious abuse of powers by the police.
4. In the winter of the same year, Premier Wen Jiabao led a national campaign to help migrant workers get back their unpaid wages—a serious problem many migrant workers throughout the country had faced—when he discovered the problem in an impromptu visit to a migrant family in a village in Chongqing. This campaign is still on-going.
5. In 2006, the central government abolished the *hukou* requirement for hiring new civil servants. New positions are now open to all citizens, including rural residents, regardless of the *hukou* status. The new move will benefit the educated population. Potentially more important for long-term policy changes affecting rural migrants, in late January 2006, the State Council issued a document entitled “Several opinions of the State Council on the question of rural migrant labour,” which considered that the *mingong* (rural migrant labour) phenomenon would very likely remain in place for many more years, if not decades. The directives asked local governments to make it easier for *mingong* to settle in towns and cities, giving priority to “model workers” and skilled workers in the rural migrant labour pool. The generally pro-*mingong* tone of the document represented a positive move for creating better work and living environments for migrant labourers and their families.
6. In June 2007, the National People's Congress passed a law that called for further protection of workers by giving state-sponsored unions more authority when negotiating wages and by providing migrant workers with written labour contracts. These initiatives had the potential to increase workers' ability to obtain long-term and stable employment. The law, set to go into effect in 2008, was passed in response to growing unrest among China's migrant labour force amid numerous cases of unpaid wages and unsafe working conditions. The law also required that employers treat migrant workers as they treat other employees. However, the 2008-09 global financial crisis has seriously hampered the

implementation of this law as 23 million migrant workers were laid off due to the slump in the export markets (Chan, 2010b).

7. In December 2009 and January 2010, the Chinese leadership publicly stated that it was to implement initiatives to let more rural migrant workers settle in small and medium cities and enjoy the same public services as those with local urban *hukou* (though small and medium cities are not the popular destinations of migrants). The subject also attracted a lot of media interest, culminating in a joint editorial by 13 newspapers in China on March 1, on the eve of the National People's Congress annual meeting. The editorial urged the Congress to take steps to initiate substantive reform of the *hukou* to liberalize conditions for the rural population to move to cities, to improve the welfare of migrants and to ultimately end the *hukou* system. However, the editorial was quickly removed from the public eyes by the authorities and no substantive discussions were held at the Congress (Chan, 2010c).

The aforementioned examples highlight mainly various governmental efforts at the national, regional and local levels to address deficiencies of and abuses generated by the *hukou* system, which, if left unreformed, could seriously jeopardize the livelihoods of migrant labourers and maybe even disrupt "social harmony." But those examples also illustrate the difficulties of more reforms and the ways in which policies of the local and the central government may contradict each other. Whereas the local governments often focus only on maximizing the direct benefits of migration for the locality (through, for example, keeping the migrant labour wages low), the central government is often caught between the dilemma of having to prevent egregious exploitation and abuses of migrant labour in cities on the one hand, and maintaining China's competitive edge in labour costs in the global market on the other (Wang, 2005b).

F. CONCLUSION

Using different data sources from various statistical agencies, this paper has analyzed internal migration trends for China since the early 1990s. Although the data are based on different definitions of the resident population and of migration, the trends based on the various datasets used are broadly consistent. It is evident from this analysis that the *hukou* system still plays an important role in defining and understanding the internal migration system in China. The number of internal migrants has increased steadily since the early 1980s, rising rapidly during the first half of the 1990s and again in the early years of the twenty-first century. It is estimated that at the end of 2008 the size of the rural migrant workers reached 140 million.

The second part of the paper described the geographical patterns of migration, paying special attention to inter-provincial migration flows. The number of inter-provincial migrants has increased rapidly since the early 1990s. The analysis confirmed previous findings that there has been an increase in long-distance migrants, spurred by significant wage differentials between provinces with low levels of economic development and those containing the centres of recent economic growth in China. At the same time, long-distance migrants have a clear tendency to concentrate in Guangdong, which has since the early 1990s risen to become the core of the "world's factory," and the Lower Changjiang Region. Over time, the number of low-income provinces from where large numbers of labour migrants originate has increased. In fact, the idea of migrating long-distance for a better job has gained popularity over time in many provinces, including those in the West region of China.

The last part of the paper focused on migration policies. The analysis suggests that internal migration trends in the 1990s match narrowing economic disparities between provinces, a finding that challenges the widely held notion that China experienced simultaneous rises in geographic mobility and in inter-provincial disparities in the 1990s. The analysis in this paper leads to emphasize the development of human capital: it is important for the Chinese government to continue promoting education and migration as a way to narrow the economic and social gaps between the coastal and inland provinces. To achieve this, emphasis has to be placed on changing the *hukou* system and the associated discrimination. The various *hukou* reform initiatives launched in the last decades have only marginally weakened the foundation of the system, i.e., the separation of two segments of the population and the discrimination against the rural segment. The *hukou* system, directly and indirectly, continues to be a major barrier for migrants from the countryside to settle in cities.

As more women and children participate in migration to cities and are staying for increasingly long periods of time, the discrimination against non-*hukou* residents in cities has become more visible and more acute (see Roberts, 1997; 2007). The problems of the non-*hukou* residents in the cities are not only related to their employment situation, but also to their standing in the urban society regarding their education, health and social security (Hansen, 2001; Lu, 2004). The central government has made efforts to address some of these issues and has initiated a number of measures in recent years, but often there is no corresponding funding available for local governments to carry out those measures (Yu, 2008). This problem is not easy to solve as local governments often take a short-term view and accord higher priority to their immediate local economy than to the migrant labour's well-being in their cities.¹²

NOTES

¹ See, for example, migration figures cited in Knight and Song (1995), p.114. Another common mistake in the literature is the confusion over migration *flow* and *stock*. See discussion later.

² One footnote in SBS (2006, table 3.5) states that its *hukou* migration data after 1990 exclude migration within the city, suggesting that the data before may have included migration within the city.

³ The 2000 year-end *hukou* or *de jure* population total for that city was 1.25 million, whereas the 2000 Census, based on exactly the same geographic boundary, reported a *de facto* resident population of 7.0 million (including 6 million without local *hukou*) on November 1, 2000 (see Chan, 2003, p. 3). A discrepancy between the two definitions is common and understandable, as in some other places like Taiwan Province of China (see Chen and Liu, 2002), but the huge differences in some cities in mainland China are truly phenomenal and they speak to the special nature of the present Chinese system.

⁴ Li and Hu (1991) estimate that about half of the floating population in large cities stayed longer than six months and a third, longer than one year.

⁵ Previously, the official per capita GDP of Guangdong, for example, in 2000 (as published in NBS, 2001) was calculated from a population figure that largely excludes this group (about 9 million in size), thereby effectively exaggerating Guangdong's per capita GDP of that year by 13 per cent, see Chan (2003, pp. 6-7).

⁶ For a study specifically on urbanization and rural-urban migration in the 1990s, see Chan and Hu (2003).

⁷ This is confirmed by a report that many rural migrant workers have returned to Jiangxi (Seattle Chinese Post, 2007).

⁸ For definitions of these (macro) regions, see notes in table 5.

⁹ The definitions and coverage used in the two surveys are not exactly the same, but the findings are broadly comparable.

¹⁰ Guangdong increased its net in-migration from 1.8 million in 1990-1995 to a whopping 11.1 million in 1995-2000 while Sichuan raised its net out-migration from 1.3 million in 1990-1995 to 3.8 million in 1995-2000 (National Population Sample Survey Office, 1997; State Council and National Bureau of Statistics, 2002). The two provinces were also the largest net importer and exporter of internal migrants in that period, respectively.

¹¹ Economic inequality has been a major policy issue on the agenda of the last two Party Congresses in China (2003 and 2007).

¹² I have argued elsewhere that granting skilled migrant labourers local *hukou* is a win-win situation for all parties, including the local economy (see Chan, 2010a).

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Part Three
Rural and urban development: Linkages and
disparities

LINKS BETWEEN RURAL AND URBAN DEVELOPMENT IN AFRICA AND ASIA

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A. INTRODUCTION

The relationship between rural and urban development is a traditional concern of development economics. While there is an established correlation between economic growth and the share contributed to it by industries and services (and the proportion of the workforce employed in them), it is less clear how policies can drive the transformation of agricultural economies into industrialised ones. Development paradigms have shifted since the 1960s, usually as the prescribed policies failed to achieve their aims, and so have views on whether economic growth should be driven by investment in industry or in agriculture. But the overarching dualistic approach, whereby traditional agriculture needs to give way to the supposedly more efficient agri-business production system and to modern, urban-based industrial and services sectors, remains pervasive.

In many instances and contexts, however, successful rural development stimulates and supports urban development, and urban development is often a key impetus to rural development, especially where the latter is based on relatively equal access to resources, that is, in most cases, access to small and medium size farming rather than agri-business production. This complementary relationship is also observed at the household level: for both poor and wealthier groups, either rural or urban-based, the diversification of income sources and asset base is an increasingly widespread strategy to reduce vulnerability and, in the most positive instances, move out of poverty and accumulate assets. It is thus perhaps more accurate to think of “development” as a blurring of the rural-urban divide, rather than an unambiguous transition.

The improved understanding of the multi-dimensional nature of poverty and of the complex strategies people adopt to construct their livelihoods has promoted renewed interest in the links between urban and rural development in recent years. Hence, the notion that people and households may engage in a number of different activities and move between different locations has gained wider currency although, on the whole, policy efforts to recognize and accommodate that notion have been insufficient.

Despite the strong correlation between increasing levels of urbanization and declines in the weight of agriculture in the economy, in many low- and middle-income countries, rural-urban migration is seen as the main source of urban poverty and therefore a problem that needs to be controlled. In most cases, however, urban population growth, driven to a large extent by the excess of births over deaths in urban areas, is more likely to be the real challenge, and one that needs to be addressed in ways that include the poor. The emphasis on rural-urban migration also tends to eclipse the importance of other forms of mobility that play a significant role in households’ strategies and local economic development.

There are other long-held policy assumptions that are challenged by a closer look at the links between urban and rural development. In the agricultural sector, it is widely held that export production is the most profitable option, and that large commercial farms are more efficient in gaining access to international markets. The case studies reviewed in this paper suggest instead that in a wide range of contexts, domestic urban markets are the key driver of increased agricultural productivity, and that such markets are better served by the more flexible family farms, provided they are well connected to local trade networks and supported by non-farm income sources.

Finally, policies that promote the development of industries in rural areas often fail to recognize that in most cases, these are effectively located in large villages or in peri-urban areas. Local authorities in these areas are not equipped with the necessary technical capacity, financial base and decision-making power to address the environmental, economic and social issues that arise in these densely populated settlements with high concentrations of small scale, often home-based enterprises that compete with residential and agricultural uses of natural resources, especially land and water.

More broadly, local Governments and local governance systems are an often overlooked but essential component of successful development. The links between rural and urban areas, people and enterprises are shaped by location-specific conditions—geographic, ecological, socio-cultural and political—which are fundamentally diverse, not only between and within regions, but also within national boundaries. Hence, while rural-urban linkages are crucial for poverty reduction as well as sustainable and equitable economic growth, they are best supported by policies grounded in a careful understanding of the local context. Information at the local level, however, is hardly provided by national data and other regionally aggregated data, making it very difficult for local policy-makers and administrators to access the basic information they need to operate fairly and effectively.

In Africa and Asia, the levels of urbanization have increased most rapidly between 1950 and 2000: from 14.5 to 36.0 per cent in Africa, and from 16.3 to 36.8 per cent in Asia (United Nations, 2008). However, these aggregated data hide significant differences between and within both the African and the Asian regions. In some cases, for example China and Viet Nam, household registration systems tie people to specific locations—but not necessarily to where they actually live—making large numbers of migrants invisible.

There are also substantial differences in the ways in which each nation defines an urban centre, and this affects primarily smaller towns (Satterthwaite and Tacoli, 2003). These definitions may change over time. In China, the estimated level of urbanization in 1999 would have been 23.9 per cent if the pre-1982 definition of urban centres had been used; 73 per cent according to the 1982 definition; and 30.9 per cent using the 1990 definition (Liu and others, 2003). Overall, temporary and circular movements, especially within national borders, tend to elude national statistics.

With this in mind, this paper draws on the growing body of empirical research at the micro-level in Africa and Asia to describe the interrelations between urbanization, mobility and local economic patterns, and discusses how policies can be more responsive to these complex and constantly evolving transformations.

B. MIGRATION AND MOBILITY

For many Governments in Africa and Asia, migration has become a key policy issue. It is seen mostly as a problem, rather than part of the solution. Across much of the African continent, it is assumed that it is poverty that forces poor people to migrate, rather than migration being a potential route out of poverty. A review of Poverty Reduction Strategy Papers (PRSPs) across Africa shows that migration is seen predominantly in negative terms, as placing pressure on urban areas, promoting the spread of crime and HIV/AIDS, stimulating land degradation and reinforcing both urban and rural poverty. Perhaps unsurprisingly, policy responses mentioned in the documents are geared primarily to reduce or prevent rural-urban migration (Black and others, 2006).

African Governments are not alone in holding negative views of migration. The proportion of low-income countries with policies to lower migration to urban centres, especially to big cities, has risen from 51 per cent in 1996 to 73 per cent in 2005 (United Nations, 2006). However, measures to control migration have often been unsuccessful. Household registration—rural or urban—used in China and Viet

Nam, for instance, has not reduced rural-urban migration, but rather increased the vulnerability of migrants by curtailing their access to basic services and worker rights (McGranahan and Tacoli, 2006). In West Africa, where there are no strict measures to control migration, there is no evidence that migrants to the cities are disadvantaged in access to housing and employment compared to non-migrants (Beauchemin and Bocquier, 2004).

But attempts to limit urban growth by controlling migration are misjudged for two other reasons: first, because migration flows are logical responses to changing economic opportunities and their spatial location; and second, because most urban population growth (not urbanization levels) is the result of natural increase rather than net rural to urban migration (Chen and others, 1998; Beauchemin and Bocquier, 2004; Montgomery and others, 2003).

1. Circular and temporary migration

Perhaps the most striking finding from recent research on mobility in both Africa and Asia is the extent and growth of circular and temporary migration. This type of movement is typically overlooked by national statistics but is a key element of the livelihoods of households in both rural and urban settlements. It is a means of diversifying sources of income and it is an important part of the links between urban and rural development, as described later in this paper. Temporary movement can also be essential to maintain an asset base—and a safety net—spread across different locations. Where access to land depends on rights allocated by the state or local authorities, temporary movement ensures that those rights are not lost (Findley, 1998; Ping and Pieke, 2003).

In Southeast Asia, urban growth and the expansion of manufacturing, especially for export, are the main drivers of temporary migration. Relatively good road networks, transport links and communications have also greatly aided mobility (Rigg, 2003). In Viet Nam's Red River Delta, it is relatively common for farmers to move to Hanoi to work in the construction sector for a few months every year (Hoang and others, 2005). In Thailand, it is estimated that one-third of all internal migration consists of temporary movement to Bangkok and its metropolitan region during the dry season, when labour demand for agricultural work decreases (Guest, 1998). In China in 1999, according to the Department of Public Security Management, 59.4 per cent of registered temporary migrants had lived in their current place for between one month and one year, 14.5 per cent for less than one month and only 26.1 per cent for over one year (Zhu, 2003). Research in the major migrant destinations in China, the manufacturing and construction hubs of Guangdong, Beijing and Jiangsu, suggests that only between 15 and 30 per cent of migrant workers intend to settle permanently in their current workplaces (Zhu, 2003).

In India, an estimated 20 million people migrate temporarily each year. It is also estimated that over 60 per cent of this movement is between rural areas, with the majority migrating from drought-prone regions to areas of irrigated agriculture (Deshingkar, 2005). However, recent research suggests that as a consequence of agricultural mechanisation, migration is increasingly towards urban centres and non-farm occupations: in northern Bihar, this type of movement has grown from three per cent of the total in 1983 to roughly 24 per cent in 2000 (Deshingkar, 2005).

In Africa, circular migration is the predominant form of movement in many nations and regions. In drought-prone areas, as in Asia, there is a long tradition of temporary migration as a coping strategy (Black, 2001; Findley, 1998). While limited infrastructure and transport links often increase the costs of movement and force migrants to stay away for longer periods of time, economic insecurity and poor living conditions in many urban centres reinforce the long-term linkages of migrants with their home areas.

Migrants not only routinely return to the resident household and consider it as their main place of domicile, but they also invest in rural assets such as land and livestock as a safety net (Krüger, 1998; Smit, 1998). This has certainly facilitated return migration processes documented in many countries in the 1990s (Jamal and Weeks, 1993; Potts and Mutambirwa, 1998). But the sheer scale of circular migration in Africa is often underestimated, as data do not easily reflect it. Drawing on census and sample census data, however, Potts (2006) shows that in Malawi, between 1976-1977 urban-rural migration was the equivalent of 61 per cent of rural-urban movement, and in Botswana for 1980-1981 it was 76 per cent (Potts, 2006).

2. Remittances as part of multi-local, multi-activities households

The overall increases in circular and temporary migration suggest that migration is part of wider household strategies that involve multi-activity—including farm and non-farm income sources—over multiple locations. Migrants contribute to their households' welfare and return on a regular basis. A study of rural-urban linkages in Mali, Nigeria and the United Republic of Tanzania suggests that about 50 per cent of rural households in the study areas have at least one migrant member, with peaks of up to 80 per cent in drought-prone areas of the Sahel. Remittances are shown to be a growing proportion of rural households' incomes; however, in absolute terms they have declined since the 1990s, due to the overall economic decline in many African nations (Bah and others, 2003). The same research shows that a growing proportion of migrants are young, single women moving independently. As the sign of profound socio-cultural transformations, even in the most traditional areas, it has become acceptable for women to migrate independently—provided they send remittances to their family (Bah and others, 2003). This echoes similar trends in Asia (Rigg, 2003). Indeed, daughters' remittances throughout the world tend to be sent more regularly, and to constitute a larger proportion of their incomes than sons' (Chant and Radcliffe, 1992; Sorensen, 2005). However, this rarely increases their decision-making on how to use the money, and may reduce their disposable incomes to the extent of increasing their vulnerability while away—for example by forcing them to live in cheap, unsafe accommodations.

In Asia, remittances from internal migrants contribute substantially to rural household budgets. In China, a survey from the Ministry of Agriculture suggested in 2004 that domestic remittances—that is, remittances by internal migrants—were about to overtake earnings from agriculture (Deshingkar, 2005). In provinces with high levels of out-migration, money earned through migration accounts for some 30 to 40 per cent of rural households incomes (Wang, 2004). In India, remittances account for about one-third of annual incomes of poor and landless households, while in Bangladesh, the Coalition for the Urban Poor estimated that migrants in Dhaka send up to 60 per cent of their incomes to relatives at home (Deshingkar, 2006). These figures are staggering, and although they should be treated with some caution because of the difficulties in obtaining reliable and comparable information, they certainly suggest that migration and income diversification are not just important but crucial for a growing number of rural households.

It is important to note that multi-local, multi-activity households not only typify the poor. In fact, they are more likely to be characteristic of better-off groups, and in many cases the poorest households are those that are unable to diversify and mobilise their labour in order to make the most of opportunities (Bah and others, 2003; Baker, 1995; Hoang, Dang and Tacoli, 2005; Hoang and others, 2008).

Coming back to policy responses to migration, it is often assumed that rural development is key in reducing rural-urban movement. However, rural development is often defined purely as an increase in agricultural production. A study of India's large Watershed Development Programmes shows that migration increases as the result of both failure and success of the projects. The latter gives local residents the financial and educational resources to migrate to better destinations (Deshingkar, 2004).

According to research conducted in Burkina Faso, factors that tend to reduce migration to the country's two cities, Ouagadougou and Bobo Dioulasso, include the presence of non-farm employment opportunities and markets in home areas (Beauchemin and Schoumaker, 2005). It is worth noting that both are usually located in large villages or small towns, which clearly play a crucial role in the economic development of their surrounding rural areas.

C. DEVELOPMENT PLANNING AND RURAL-URBAN LINKAGES

Virtually all national policies have an impact on the form and the spatial distribution of economic activities and investment. As a consequence, they also have a huge impact on the nature of both rural and urban development, and on the links between them. Increasingly, so does the internationalization of trade and production.

Regional planning and spatial development strategies more closely address the links between rural and urban development, but, as should be expected, they are shaped by the predominant paradigms of economic development at any given time. In the 1960s, they were designed to achieve economic growth by stimulating industrial development through public investment in designated centres or growth poles. These strategies had no rural development component and, unsurprisingly, they had few positive effects on surrounding rural regions; the beneficiaries were essentially already privileged groups and large urban centers (Douglass, 1998; Hardoy and Satterthwaite, 1986).

In the 1970s, urbanization came to be seen as a parasitic process leading to underdevelopment and the neglect of agriculture. The policy response was the implementation of Integrated Rural Development Programmes focusing on agricultural change with little, if any, attention to the role of urban centres in the rural economy (Escobar, 1995). Later, structural adjustment programmes showed renewed interest in rural-urban linkages, but predominantly as market linkages connecting agricultural producers to mainly export markets. Yet again, these policies did not have any proven impact on rural poverty. In most African countries, access to international markets has not resulted in increased agricultural productivity (Kessides, 2005). The role of the state in providing access to inputs, credit, markets and basic infrastructure all but disappeared in the 1980s and 1990s, while private investment in the agricultural sector has been limited to large commercial farming, often generously subsidized (Toulmin and Guèye, 2003), leaving the majority of small-scale African and Asian farmers unable to access global markets.

Overall, a key concern is the fact that both rural and urban planners continue to think and operate within rather narrow sectoral and spatial boundaries, despite the fact that rural-urban linkages are the reality for households in both towns and villages. The 2008 World Development Report "Agriculture for Development" (World Bank, 2007), is a good example of how the role of urban centres in rural development continues to be ignored. Even references to the importance of rural non-farm employment fail to mention that, in most cases, this means work in small-scale enterprises based in small towns or large "urbanizing" villages.

1. Agricultural growth and rural development are not the same

Most development policy and practice equates agricultural growth with rural development. Since the majority of the world's poor live in rural areas, it seems logical that growth in that sector should reduce poverty (World Bank, 2007). This view, however, neglects the importance of non-farm incomes and mobility for what is probably the majority of the world's rural population. The diversification of income sources, often including remittances from migrant family members, is not only critical for the well-being of rural households, as described above, but also has significant implications for agricultural production itself. In Botswana, low-income urban households maintain livestock and farms in their own areas. In Gaborone alone, about half of all low-income urban households do so; perhaps more

surprisingly, about a third had moved to the city more than 20 years earlier (Krüger, 1998). While investments in rural assets are essentially a safety net for the urban poor, these assets are shared with and looked after by family members and contribute to the local economy.

In Africa's dry lands, farmers' small investments in technologies and products are very often funded by non-farm incomes and remittances (Tiffen, 2003). In Viet Nam's Red River Delta, farmers' seasonal migration to work in Hanoi's construction sector finances agricultural intensification and diversification into higher-value products (Hoang, Dang, and Tacoli, 2005). It is also generally assumed that technological innovation is just a matter of public investment and farmers' training. Evidence shows instead that farmers that are more prepared to innovate—and face the potential risks this entails—are those that can rely on non-farm incomes as a safety net (Hoang and others, 2008).

Another issue that regularly appears in agriculture-based rural development planning is the need to better connect farmers to new dynamic markets. In many cases, this means international markets. However, there is evidence that domestic urban markets are a much better option for farmers, as they tend to be more stable. In Viet Nam, up to 2001, around 80 per cent of the export value of the country's fresh fruit came from China. Since China's accession to the World Trade Organization, tighter regulations on fresh fruit imports and more favourable tariffs on imports from Thailand have negatively and rather abruptly affected Viet Nam's mostly small-scale fruit producers. Currently, China accounts for just 40-50 per cent of Viet Nam's fruit export value. In terms of quantity, fruit production has more than doubled in a decade, from 3 million tons in 1995 to over 6 million tons in 2005; of this, only 10-15 per cent is for export. What has changed dramatically is the level of domestic consumption of fruit, which has doubled in the last decade in both rural and urban areas but with higher per capita expenditure in the urban centres. These changes in dietary and food expenditure patterns are closely linked to the rapid improvement of the living standards of Vietnamese households (Hoang and others, 2008).

It is not only in countries experiencing rapid economic growth and higher household incomes that urban markets are a better option for farmers. In West Africa, urban centres are the largest and fastest growing market for food producers. Over 80 per cent of the total agricultural production is consumed within the region (Club du Sahel, 2000). Growing demand has resulted in a more diverse production, from basic grains to maize, cowpeas, sesame and fresh vegetables, and substantial increases in per capita production (Tiffen, 2003; Toulmin and Guèye, 2003).

The examples from West Africa and Viet Nam also show that small-scale farmers rely on a relatively well-developed network of local traders. Traders are rarely mentioned in agricultural policies, which instead regularly refer to the much less specific "access to markets." But for the majority of small farmers, local traders are the main links with markets. Although they are often perceived as exploitative, traders provide vital links to small and diversified production flows that are not sufficiently profitable to attract large-scale trading organizations (Pedersen, 2000).

In many African nations, traders also have an important function as providers of credit. In West Africa, wholesale traders are usually women who tend to establish personal relations with both producers and retailers. In this way, financial exchanges are embedded in wider social relations that provide the basic rules of trust needed in commercial transactions. The major problem confronting most of these traders is limited financial liquidity, which makes them and, as a result, their creditors, vulnerable to market losses. The vulnerability associated with lack of liquidity is compounded by poor physical infrastructure and lack of storage and processing facilities (Bah and others, 2003).

Recent research in Viet Nam's Mekong Delta highlights the role of traders as agents of rural development (Hoang and others, 2008). In this fruit production area, mobile traders collect produce at the farm gate and channel it to larger market nodes where it is matched to specific market segments

depending on its grade. Grading and packaging are carried out locally, providing non-farm employment to local residents and people from the surrounding rural area. In turn, this concentration of activities creates further demand for services such as hairdressing, cafés and restaurants, transport and porting. In the most dynamic of these rural settlements, about 70 per cent of local household incomes originate from trade and services, and less than 20 per cent from agriculture (Hoang and others, 2008, p. 26). The key elements of these “virtuous circles” of rural-urban development are: good communications and transport links, which enable traders to maintain extensive networks throughout the country; a good local infrastructure that allows the collection of fruit even from relatively remote areas; equitable access to land, so that the benefits of access to markets accrue to a broad base of local residents; and non-farm employment opportunities, both local and in the region’s cities. These non-farm employment opportunities provide cash for investment in farm diversification and intensification and, for the poorest households with limited labour or land they provide a lifeline to generate income outside the agricultural sector.

Urbanization and rural development are thus closely linked. On the one hand, incomes from non-farm activities, often earned in cities and towns, both local and further away, provide vital capital to small-scale farming and a safety net that encourages innovation. On the other hand, domestic urban markets are more stable than export ones, and stimulate production by small-scale farmers who can respond rapidly to changes in consumer preferences, unlike most large commercial farming. Access to domestic markets is effectively managed by extensive networks of local traders who, unlike exporters, do not rely on centralised processing and packaging but prefer to concentrate these operations as close as possible to the production areas to minimise losses. This, in turn, creates local non-farm employment which is especially valuable for poor groups who cannot afford to migrate to urban centres. Hence, while agriculture remains the main component of the rural economic base, its diversification at the settlement and household levels relies on strong links with urban food and labour markets. Rural development policies that build on and support these linkages are more likely to be successful than those that focus narrowly on agricultural production.

2. Rural industrialisation

Promoting rural industries to absorb surplus labour while reducing migratory pressures on cities has long been an aim of many national Governments, especially in Asia. In China, township and village enterprises (TVEs) grew enormously between 1978 and 1994, when their share of the gross national industrial output went from 9 per cent to 42 per cent, and their contribution to the total state revenue from 4 per cent to 22 per cent (Kirkby, Bradbury and Shen, 2000). By 1997, the rural TVE sector in China employed nearly 30 per cent of the rural labour force.

In Thailand, since the 1980s, processes of rural industrialisation have involved both the growth of local enterprises and the rural relocation of export-manufacturing factories (Rigg, 2003). In Viet Nam, rural and peri-urban craft and industrial villages (CVIs) are estimated to account for 41 per cent of total GDP and employ 64 per cent of the industrial workforce (Douglass and others, 2002). The majority are household enterprises (83 per cent of the sector’s contribution to GDP and 58 per cent of the workers), the rest are domestically owned small and medium-sized enterprises. Both categories are linked to domestic urban markets as well as to international markets, and are located primarily in high-density rural and peri-urban areas such as the Red River Delta (Douglass and others, 2002; Hoang, Dang and Tacoli, 2005).

In Eastern Asia, a large proportion of rural enterprises are located in sizeable settlements with strong non-agricultural economic bases and which could be classified as urban centres. In many cases, these enterprises are not linked to the local agricultural base, and may be in competition with farmers for access to land and water. In China, although TVEs are often portrayed as examples of rural industrialisation in remote rural areas, the most successful ones were established in peri-urban areas, outside built-up areas but often in the proximity, if not within, the administrative boundaries of urban

centres (Webster and Muller, 2002). Trade liberalisation has affected small rural enterprises everywhere. In India especially, household enterprises lost to competition from imports, and the share of the rural non-farm sector in total non-farm net domestic product decreased from about 35 per cent in 1981 to under 32 per cent in 2001 (Mukherjee and Zhang, 2007). In China, those that have survived increasingly concentrate in the high-growth eastern provinces of the country, which absorb 90 per cent of foreign direct investment and, in so doing, contribute to the growing regional inequalities that are at the root of China's internal migration.

Another growing challenge of rural industrialisation is that local administrations usually do not have the revenue and the capacity to address the environmental impacts of the enterprises' activities. In the mid-1980s, it was estimated that one-third of China's gas emissions, one-sixth of solid waste production and one-sixth of water pollution were generated by TVEs (Kirkby and others, 2000). Stricter environmental regulations introduced in the 1990s resulted in the national Government ordering the closure of tens of thousands of TVEs engaged in highly polluting activities (Webster and Muller, 2002). In Viet Nam, the urbanizing villages of the Red River Delta face similar problems. Increasingly, the survival of rural manufacturing enterprises is linked to their capacity to relocate to industrial estates that have pollution control facilities, but this relocation requires capital and is clearly not an option for most household enterprises.

In summary, most rural industries are in many cases small-scale enterprises, often operating at the household level. Despite this, they are linked to domestic and sometimes export markets, and are crucial in providing non-farm employment to the rural and peri-urban poor. However, they are vulnerable to international competition. In addition, they are in most instances located in 'rural' settlements, where local administrations lack the capacity and revenue to address environmental pollution, which can affect residential and agricultural areas. This is of particular concern since, especially in Southeast Asia, rural industrial activities tend to concentrate in densely populated peri-urban areas and larger settlements.

D. CONCLUSIONS

The central argument of this paper is that the ongoing economic, social and demographic transformations in most parts of Africa and Asia are best understood as processes based on a complementary relationship between rural and urban development and a blurring of the rural-urban divide, rather than as relatively clear-cut transitions. The main implication for policy is the need to support local governance systems that take account and respond to these changes and to the emerging and novel challenges that these changes present.

Local governance systems can play a key role in determining the nature of rural-urban development, especially in ensuring that it does not result in the social and economic exclusion of vulnerable and marginalized groups. Success in this regard, depends in part on whether national institutional frameworks provide a space for local decision-making. Small and intermediate urban centres have traditionally been the focus of regional development strategies, but many growing agricultural market nodes and small-scale manufacturing settlements are still classified as "rural" and therefore often lack the levels of technical competence and financial resources that are associated with urban status (Tacoli, 2006).

Crucially, the governance of rural-urban development is a balancing act between supporting the high levels of mobility and occupational diversification that are so important for households and communities alike, and ensuring that their potentially negative impacts do not become a reality.

High levels of mobility and remittances from internal migrants are generally positive, not only for the households that receive them. Remittances can have a critical impact on the economy of small towns, for example, through investment in housing and, where migrant hometown associations are active, in the construction of public facilities such as schools, religious centres, water points (Okali and others, 2001). New employment opportunities in construction, services and sometimes agriculture, in turn, often attract in-migrants. But there can also be negative impacts for non-migrants and for the wider settlement; for example, increases in land value and unregulated residential construction encroaching on farmland and increasing environmental risks (Bah and others, 2003; Serageldin and others, 2005). Governance systems in the context of growing mobility will need to respond to the needs and priorities of these different groups to avoid social and economic polarisation between migrants and non-migrants.

With regard to occupational diversification, the main challenge is to protect natural resources, especially land and water, from industrial pollutants while also ensuring that non-farm employment is available locally to those groups that need it most, especially the poor and vulnerable. Small-scale and household enterprises who employ the poor, find it most difficult to comply with environmental regulations that are not tailored to the size of their operations and capital (Hoang and others, 2005).

The challenges outlined above can have long-term consequences in Africa and Asia, and their management is likely to become more urgent in the foreseeable future. Whether they will be addressed in ways that support development that is environmentally, socially and economically sustainable will depend largely on developing modes of local governance that are inclusive, accountable, effective and supported by national Governments.

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SOCIAL AND ENVIRONMENTAL ASPECTS OF PERI-URBAN GROWTH IN LATIN AMERICAN MEGA-CITIES

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A. INTRODUCTION

Latin America has been through significant urban transformation in the last decades. Modest economic growth, high population growth and significant rural-urban migration resulted in a scenario of urban crisis across the region in the 1980s and 1990s, with spreading shantytowns, ill-regulated land use, inadequate sanitary conditions and increased poverty. Major metropolitan areas, such as Mexico City, Caracas, Bogota, Rio de Janeiro, Lima and São Paulo, were challenged by violence, poverty, and environmental problems. Notwithstanding significant improvements in the past few years, important challenges still remain for Latin America's large urban areas.

General urbanization and economic trends have contributed to making poverty an urban issue. While poverty has been decreasing in global terms, there is substantial evidence that the share of the population living on less than one dollar a day declined in rural areas but increased in urban areas during the 1993-2002 period (Ravallion, Chen and Sangraula, 2007). According to the latest estimates (2008) of the Economic Commission for Latin America and the Caribbean (ECLAC), urban poverty increased significantly in Latin America and the Caribbean between 1980 and 2000 and declined after that. In 2007, the percentage of urban population below the poverty line (28.9 per cent) was still very high and similar to the levels observed in 1980.

Although population growth rates have been steadily declining in Latin America, urban areas were expected to gain an additional 166 million inhabitants in a 30-year period (2000-2030); in 2030, the urban population is projected to reach a total of 610 million. Such figures indicate that almost all population growth in Latin America will take place in urban areas and within a region that is already significantly urbanized—these same estimates forecast an urban population growth rate of 1.4 per cent a year between 2000 and 2030. Similar forecasts have been produced by other sources (Montgomery, Stren, Cohen and Holly, 2003).

Even those cities in Latin America that present an overall low population growth rate may undergo substantial changes in its population from an intra-urban perspective. Some of them, for example, Mexico City and São Paulo, are losing population in their most important central areas, while distant suburbs still experience strong demographic increases (Salas, 1994; Torres, Alves and Oliveira, 2007). This urban dynamic may become a major challenge for environmental and social policy management, especially in a context of inadequate information systems on urban expansion. Although we do not have comprehensive data to support this trend, peri-urban areas in large and medium cities are likely to have the bulk of Latin American population growth in the coming years, a phenomenon that is also happening across different Asian and African metropolises (Asian Development Bank, 1997).

Peri-urban growth—also referred to as suburban expansion—is not exclusive to Latin America, but rather a challenge to most countries in the developing world. As opposed to the upscale suburbanization of developed countries (Duany, Zyberk and Speck, 2000), most peri-urban growth in Latin America results from massive rural land reclamation by migrants trying to settle in poor tenements. Such areas are not only typically ill-regulated and distant from key employment hubs, but also present appalling sanitation conditions and significant environmental problems, including deforestation and pollution of rivers and streams. Metropolitan fragmentation—a characteristic of many metro areas, which lack planning

coordination and proper funding for their peri-urban municipalities—adds to the already unacceptable living conditions of the newly arrived.

In view of this unfortunately common scenario, the aim of this paper is to stress the importance of peri-urban growth for the contemporary development agenda. Concern for peri-urban expansion should be at the core of most initiatives conducted in large urban areas of Latin America, ranging from poverty alleviation to environmental sustainability. Although sometimes understood as part of the slum problem (UN-Habitat, 2006), it is important to notice that peri-urban expansion differs from it in some of its key features, particularly in regard to the social isolation and environmental degradation experienced by its dwellers, as well as the limited information city officials have about it.

In the first section of this paper, we discuss some of the existing conceptual issues regarding urban phenomena. Next, we describe the most important urban demographic trends in the region, as well as their consequences for the urban environment. The third section presents some of the most important economic and institutional factors that influence such trends, while the fourth outlines some of the outcomes from the perspective of public policies—particularly zoning, housing and transportation—with special focus on the problem of land use and its connection to environment and migration. Finally, we stress the key issue of deficient information on peri-urban expansion, and how international cooperation could help improve this situation.

B. CONCEPTUAL ISSUES

Providing a precise definition of urban areas where the poorest social groups live is a rather complex task, since a myriad of different concepts are often employed to describe similar—yet not fully equal—situations. Particular neighborhoods inhabited by poor dwellers are described in Latin America as slums, shantytowns, illegal settlements, ghetto or segregated areas, among others. When considering those same poor areas, but taking into account their particular spatial dimension, a range of other terms are used in the literature to refer to the same phenomenon—namely peri-urban, suburban, periphery, exurban and urban fringe. It is important to notice, however, that not all peri-urban or periphery areas can be considered poor.

One of the most popular (and generic) categories in the field is slum. Slums are regarded as those “settlements in urban areas in which more than 50 per cent of their inhabitants live in inadequate housing and lack basic services” (UN-Habitat, 2006, p. 19). In order to assess slum conditions, the authors looked at the existence of one in five important housing conditions: durable housing, sufficient floor space, access to treated water, access to sanitation and secured tenure. This definition is quite useful because the slum population can be measured with general census or household survey data. However, it does not consider particular legal aspects related to land property, which makes the slum concept less useful if the approach aims at supporting targeted public interventions.

Some authors prefer more specific denominations, such as shantytowns and illegal settlements. Shantytowns are located in invaded land, while illegal settlements are urban areas legally bought by urban dwellers, but whose development is not fully recognized by the city government (Lim, 1995). In this sense, shantytowns refer to a very straightforward dimension related to the invasion of private or public land, a practice that is quite common in countries in which the legal system has difficulty in enforcing property rights. Public areas such as squares, parks and even streets are also frequently invaded, especially when the urban infrastructure is not fully in place. The second form of illegality—referred to as illegal settlements (Lim, 1995)—indicates the general disrespect for zoning and building norms, particularly by private developers, who then sell low cost lots or housing units to recent migrants or ill-educated people unaware of urban regulations. This overall disregard for zoning and building norms is

often associated to excessive red tape or even corruption from government officials (Werna, Blue and Goldstein, 1998).

We believe that the general concept of slum adopted by the United Nations Human Settlement Programme (UN-Habitat) (UN-Habitat, 2006) is less useful for more in-depth policy analysis because shantytowns and illegal settlement issues must be addressed differently by general urban polices. In the case of shantytowns, policies must consider the issue of land tenure, while in the case of illegal settlements they should address the issue of unattained urban regulations. Significant infrastructure problems (such as lack of sanitation) happen both in shantytowns and illegal settlements due to the limited income of the population and the important difficulties faced by state agencies to provide services in illegally registered and “invaded” land.

There are different dimensions of illegality regarding housing and urban settlements in urban areas of most Latin American countries. The irregularity of land use somehow “justifies” the non-provision of social services (Torres, 2002a). It seems more difficult to find proper site location for social equipment in irregular or illegal land. Sometimes the State refrains from investing in such areas due to the risk of having public investment appropriated by private owners. Lawsuits against public administrators that do not comply with the complex set of standard procedures may also happen in regard to land use regulations.

General estimates of the population living in shantytowns and informal settlements in developing countries vary from 30 per cent in large Latin American cities to 80 per cent in African ones (Schteingart, 1989; Lim, 1995). Estimates for such a population based on the slum concept are quite similar. The slum population of Latin America and the Caribbean reached 31 per cent of the total urban population in 2005, according to UN-Habitat estimates (2006).

Most shantytowns, illegal settlements or slums are located in peri-urban regions. However, neither slums nor shantytowns are spatial concepts—a dimension that is critical to allow us to better qualify poor urban neighborhoods. In order to address such spatial dimension, we focus on peri-urban areas—other expressions such as periphery or suburban could also be used to refer to them. Although there is no precise definition of peri-urban areas, there is some common understanding that they are located in-between consolidated urban regions and rural ones. They typically have lower demographic density, worse sanitation indicators, poorer urban infrastructure and mixed land use (Asian Development Bank, 1997). In Latin America, those areas also tend to be occupied by low-income families (Roberts and Wilson, 2009), even though wealthier enclosed neighborhoods are also spreading across some peri-urban parts (Sabatini, 2004).¹

It is important to note that conditions in poor peri-urban areas differ from slums in significant ways. Slum location may have significant impact in the living conditions of its dwellers, and not necessarily all slums are peri-urban. When in peri-urban areas, slums tend to be less consolidated, with worse sanitation conditions, and more of an unknown territory to both the government and the general public, while those close to affluent areas present better general socioeconomic conditions and access to jobs (Marques and Torres, 2005). Finally, housing in peri-urban areas, whether slums or more affluent sites, are more prone to environmental and sanitation problems.

In most cases, poor peri-urban areas may also be considered segregated. Spatial segregation is an important sociological concept that expresses the degree of social and spatial separation between different social groups, such as black and white or rich and poor (Massey and Denton, 1993; Mingione, 1999). In spite of the important international intellectual tradition and growing acceptance of this concept in public policy debates in Latin America, we will not address it in this paper because not all segregated areas can be regarded as peri-urban. Thus, our perspective is that poor peri-urban areas include a special type of

segregation—they are located in the urban fringes, home for minorities and low-income families, distant from the main employment centers, with critical infrastructure shortages and environmental problems.

Finally, in spite of its imprecision, it should be noted that the peri-urban concept addresses important dimensions of urban poverty—particularly in relation to their spatial distribution, patterns of segregation, environmental and infrastructure conditions. The peri-urban population and its spatial distribution can be assessed through the usage of intra-urban disaggregated census data. We further discuss this issue below.

C. PERI-URBAN DEMOGRAPHIC FACTS IN LATIN AMERICA

Latin America—already a highly urbanized region—should continue to expand the size of its urban population in the near future (UNFPA, 2007). As discussed in the previous section, regardless of the conceptual debate around the definition of peri-urban zones, when we consider recent demographic dynamics of cities such as Buenos Aires, Mexico City, Lima and São Paulo, it seems clear that an important share of the future Latin American demographic growth will occur in poor suburbs or poor peri-urban areas (Roberts and Wilson, 2009; Torres, Alves and Oliveira, 2007). This section focuses on these issues.

1. Latin America's overall urban trends

Latin America is the most urbanized region of the developing world. In 2010, the urban population will represent 79.3 per cent of the total population, according to the World Urbanization Prospects 2007 (United Nations, 2008). This estimate, however, relies on the different national definitions of urban and rural, and they can vary significantly. Cities with 750 thousand inhabitants or more will host almost 216 million people in 2010, or approximately 36 per cent of the region's total population and 46 per cent of the total urban population (table 1).

The proportion of the urban population living in cities with 750 thousand inhabitants or more is large (above 45 per cent) in the largest Latin American countries, that is, Argentina, Brazil, Colombia and Mexico. Central American and Caribbean countries such as Guatemala, Honduras, Cuba, the Dominican Republic, and Nicaragua, on the other hand, present lower levels of urban concentration—an indication that the intense urbanization process in Latin America is not homogeneous at all. While the urbanization of larger countries is very advanced and concentrated in big cities, smaller countries, especially those located along the Caribbean, present quite a different trend. This evidence also suggests that the traditional rural development strategies proposed by many international advocates will probably have less impact on the largest Latin American countries from now on.

In spite of the critical importance of these issues for the urban agenda of most countries, it should be noted that small cities tend not to suffer much from the peri-urban dimension we want to highlight here. Although there may be variations in terms of housing conditions within a small town, peri-urban growth becomes a more challenging problem when cities start to scale up. Mayors in small towns are usually capable of resorting to their personal networks to gather the required information on service coverage and inequalities among areas, as well as become aware of key neighborhood demands. In such towns, when accelerated growth is not an issue and the basic sanitation system is already in place, the demand for new urban infrastructure is often quite manageable. Broadly speaking, smaller cities are more capable of managing a moderate level of urban expansion, but it should also be noted that they do not always have the financial and human resources available to larger ones. Even so, although sensible for the majority of small towns in many Latin American countries (i.e. southern Brazil, Argentina, Chile), the argument of manageability is not applicable to severely poor areas and/or fast growing frontiers.

TABLE 1. TOTAL POPULATION AND PER CENTAGE OF THE URBAN POPULATION IN CITIES WITH 750,000 INHABITANTS OR MORE, BY COUNTRY.
LATIN AMERICA AND THE CARIBBEAN, 2010

<i>Countries with cities with 750,000 inhabitants or more</i>	<i>Population in cities with more than 750,000 inhabitants</i>	<i>Percent of the country urban population</i>
Argentina	17,566	46.7
Bolivia	3,243	48.6
Brazil	81,683	47.4
Chile	6,760	44.3
Colombia	18,150	50.5
Costa Rica	1,374	45.8
Cuba	2,159	25.3
Dominican Republic	2,298	32.0
Ecuador	4,536	49.2
El Salvador	1,520	34.7
Guatemala	1,104	15.5
Haiti	2,209	44.3
Honduras	1,022	27.8
Mexico	44,974	52.4
Nicaragua	944	28.2
Panamá	1,379	52.5
Paraguay	2,030	51.1
Peru	9,237	44.6
Puerto Rico	2,758	68.8
Uruguay	1,504	48.2
Venezuela	9,442	34.6
Total in Latin America and the Caribbean	215,890	45.8

Source: United Nations World Urbanization Prospects, 2007 (United Nations, 2008).

1. Excluding Bahamas, Guyana and Suriname

2. In the case of Argentina and Mexico, we used data for metropolitan areas

2. Peri-urban demographics

Even when we consider only the most important Latin American metropolitan areas, two major reasons make it difficult to estimate their poor peri-urban population. The first problem concerns the precise definition of what peri-urban really is—there is no consensual indicator employed, and several terms are used in the literature to refer to the same phenomenon (see section 1).

The second challenge regarding poor peri-urban population estimates refers to the scale of the spatial unit of analysis. Torres (2002b), for instance, tried to define peri-urban as the municipalities, other than state capitals, of Brazil's most important metropolitan areas. That paper indicated that 43 per cent of the metropolitan population in Brazil lived in such cities in 2000, which have grown faster in the recent past, are poorer and, more often than not, lack basic sanitation.

However, using city limits to define peri-urban boundaries clearly provides a very rough definition of the phenomenon, and probably substantially underestimates its population, since this kind of area also exists within capital cities. Only an analysis in terms of districts or census tracts for a significant

number of metropolitan areas can provide a more appropriate description of the poor peri-urban population and its distribution. In fact, there is a new generation of studies that use geographic information systems to quantify the concentration of poor families in poor peri-urban areas (ECLAC, 1997; ECLAC, 2000; Rodriguez, 2007; Torres, Alves and Oliveira, 2007; Roberts and Wilson, 2009). These studies indicate that poor peri-urban areas are both significant and growing fast.

In spite of the difficulties to precisely measure the size of the poor peri-urban population in Latin America, a significant number of both quantitative and qualitative case studies indicate that its expansion is a key issue for Latin America's development agenda (Stein and others, 1992; Roberts, 1994; Arriagada and Rodrigues, 2003; Marques and Torres, 2005; Roberts and Wilson, 2009).

These studies show that the lion's share of Latin American population growth in the near future is most likely to occur in peri-urban areas, particularly due to their fast expansion within urban areas that already present considerable population growth. The peri-urban problem is also quite evident for any observer of the metropolitan scene in the region.

3. Consequences of peri-urban expansion

Many large Latin American municipalities were already overwhelmed by their traditional roles of providing urban infrastructure, health and education services, land use control, garbage collection and housing. The number and complexity of services provided by municipalities are also growing due to the "worldwide movement to decentralize" (World Bank, 2003, p. 89).³

Overall urban expansion and the increase in the number of automobiles also require dramatic investments in transportation infrastructure (highways, tunnels, etc.). As a consequence, the competition for resources between different regions of the city, as well as between different branches of the Government, may cause traditional social policies to struggle for funding.

Although policy decentralization is an important issue per se, in our view, the scale of the city is particularly important for peri-urban regions. In larger urban areas, poor peri-urban growth is less visible because the key sources of information on urban expansion are either real estate records employed for fiscal and tax purposes or other administrative records. Since such records do not include irregular or invaded areas, a significant share of poor peri-urban dwellers—most of them living in shantytowns and illegal settlements—becomes "invisible" for important urban public policies.⁴

This lack of visibility—among other reasons—produces significant consequences for the coverage and quality of social services in poorer areas. When present, services are of inferior quality, which means distant schools, high absenteeism of doctors and teachers allocated to work in such districts, and a significant social abyss between service providers and their customers (World Bank, 2003, p. 22). However, invisibility is only one of the many issues in poor peri-urban areas. The following are also worth mentioning:

- a. A significant share of the poor peri-urban expansion can be explained by shantytowns and illegal settlements growing in the urban fringes of Latin American cities. Torres, Alves and Oliveira (2007) estimated that illegal occupation accounted for 43 per cent of the population living in peri-urban areas of the city of São Paulo in 2000, which induces further population growth and deforestation. In other Latin American cities, Governments have had enormous difficulties in regulating this process, with the exception of Santiago, Chile, where urban expansion is more organized;⁵

- b. The persistent horizontal growth of Latin American cities requires a continuous extension of the network of public services to peri-urban areas, even when the infrastructure already in place in central areas is not used to its full potential;
- c. Generally speaking, poor peri-urban dwellers are much less well-off and educated than the average inhabitant of metropolitan areas, and live far from the most important job hubs. They have worse access to social services, and are served by crowded schools and precarious health care facilities;
- d. This urban sprawl also has significant consequences in terms of transportation. In both developed and developing countries, peri-urban housing means longer journeys, increased demand for transportation investments, increased urban congestion and intense air pollution (Duany, Zyberk and Speck, 2000);
- e. Poor peri-urban areas are also characterized by lack of sanitation and the consequent pollution of rivers and streams, as well as deforestation and destruction of the natural landscapes that still surround metropolitan areas.

It is quite clear that the concentration of social, environmental and legal problems in poor peri-urban areas make them ill-suited for population growth, where it nevertheless tends to occur at an accelerated pace. In the following section we discuss the reasons behind the current peri-urban expansion trends.

D. WHY IS PERI-URBAN EXPANSION HAPPENING?

Lessons from different Latin American cities indicate that peri-urban growth is not necessarily a consequence of overall population growth. Even when the growth rate is low, many large Latin American cities still present significant peri-urban expansion (Salas, 1994; Torres and others, 2007). The dynamics that determine peri-urban growth in Latin America are quite complex, and involve a number of dimensions—from land regulation and taxation to infrastructure and housing policies. Private companies also play a significant role in this situation, since they influence both the offer of housing space and the price of land. As a result, people settle farther away even when vacant areas in more affluent parts of the city are still available.

It is essential to notice that the land market is a major force shaping peri-urban expansion, since it restricts the set of housing possibilities for families based on their available income. In cities whose population includes a substantial share of poor families, the Government and/or private companies must develop housing units that cater to their needs, so as to prevent them from finding alternative housing solutions on their own. Needless to say such alternative solutions almost always go directly against city planning guidelines and the general legal framework, not to mention architectural good practices. In many Latin American cities, such as Caracas, Bogota, São Paulo and Tegucigalpa (Pearce-Oroz, 2001), a large number of poor families has moved to unsuitable, risk areas, where their lives are constantly threatened by environmental hazards such as floods or landslides.

In addition to the scarcity of resources for a massive Government housing police, the reasons for the unavailability of proper housing for the poor in Latin American countries is also related to economical and institutional dimensions that significantly shape housing markets and the offer of housing units (World Bank, 2003). Among such dimensions, the following should be highlighted:

- a. Credit is a major problem. Macroeconomic instability narrowed credit options in many Latin American countries during the 1980s and 1990s. While it is generally understood that funding for housing projects is a key issue regarding peri-urban improvement, it should be noted that shantytowns are already a reality in many Latin American countries. Land regularization

- b. The offer of private credit is not only constrained by interest rates but also by the legal framework vis-à-vis evictions and repossession of property used as collateral. Such legislation strongly influences banking behavior in providing credit for property acquisition. Without proper legislation, most of the credit for housing in many Latin American countries is provided by government organizations alone, which are by definition limited by fiscal constraints. However, even in well developed housing markets, part of the offer must rely on public subsidies to serve the poorest groups of the population;
- c. General property rights and land tenure legislation also influence the likelihood of land regularization policies. Very costly judicial processes—which often take many years to come to a conclusion—discourage low-income dwellers to defend their rights through the justice system. Again, red tape and corruption are not uncommon in this area;
- d. Urban zoning and building norms tend to artificially influence land availability and price. Zoning restrictions that forbid vertical building, for instance, render important central areas with often low population density and ample infrastructure a very expensive housing option. This kind of building norm, albeit producing highly desirable neighborhoods, such as Vitacura in Santiago, Polanco in Mexico City and Jardins in São Paulo, also induces the horizontal spread of the rest of the city, leading to inevitable peri-urban settlements.

Different institutional reforms are in place in Latin America regarding its housing markets, but whether they will be able to produce significant change in the near future remains to be seen. Most likely, Latin America will still have to deal with peri-urban unregulated growth for quite a significant time. In the following section, we discuss some policies that may help in this regard.

E. PERI-URBAN GROWTH AND PUBLIC POLICIES

While it would be impossible to present here a comprehensive discussion on all urban policies and their relation to peri-urban expansion, the paper would briefly discuss how three different policies, namely, zoning, transportation and housing, could influence such an expansion and lead to a more sustainable use of space in the concrete territories and institutional contexts of the complex Latin American metropolitan areas.

1. Parks, zoning and building norms

The development of parks and conservation areas, the establishment of zoning guidelines and the introduction of building norms are among the most important urban environmental policies. These policies benefit from the traditions of urban and environmental planning that had in Olmsted (1870) one of their first and most representative thinker and practitioner. They are clearly connected to the possibility

of developing large cities with significant life quality in the developed world (Platt, 1994). By definition, these policies are tailored to coordinate more sustainable use of urban space.

However, such policies are not clear-cut. On the one hand, very restrictive zoning and building norms make land scarcer, increasing its price. If such a price effect can be affordable in richer areas, this is not necessarily true for poorer ones. Most likely, restrictive zoning in one area of a metropolis will induce or redirect migration to other places of the metro region. On the other hand, when restrictive zoning is not well enforced, it may produce other complex, unintended consequences in terms of intra-urban demographic responses from local dwellers (Henderson, 2004). For instance, in São Paulo, Brazil, the law ensuring protection of water source areas—that in the 1970s restricted the occupation of almost all the Southern Region of the Metropolitan Area—has contributed to the extensive occupation of such protected areas by poor households due to lack of enforcement (Torres, 2007).

Frequently, the price effect of the zoning policy is addressed by the taxation of land. Some policymakers try to implement progressive land taxation in order to capture part of the value that landowners get as a result of the increased valuation of their properties in more preserved areas. However, fighting for a progressive taxation in a context of politically powerful landlords is far from simple, and may also have cross-border unforeseen consequences in the fragmented political landscape of many Latin American metropolitan areas. Different municipalities within the same region may tax differently, producing considerable difficulties regarding property taxation. Most important, in order to work properly, zoning policies require certain preconditions not necessarily present in developing countries, for instance, the stability of the judicial system and the enforcement of property rights, urban norms and regulations (North, 1990).

In summary, the background of ill-regulated land use seems to significantly erode the possibilities of traditional urban environmental policies in large cities of developing countries. It may be true that, were those rules enforced, they would discourage migration and peri-urban growth, since the costs of housing would increase significantly for newcomers. However, the huge cultural and institutional transformation that such enforcement demands makes it quite a remote possibility in the short term.

Although increased stability of the judicial system and law enforcement are highly desirable long-term institutional goals—with clearly positive environmental impacts—it could be useful to reflect on what can be done while it does not come to pass:

- a. Laws and regulations should be simpler in order to stimulate and help their enforcement, curb corruption and reduce overall transaction costs and, probably, the price of land (World Bank, 1999);
- b. The level of standards should be proportional to the institutional capacity to enforce them. Attained moderate standards are much better than higher but hardly reachable ones;⁶
- c. It is important to promote the coordination of land use legislation across different municipalities within the same metropolitan areas, so as to prevent unintended cross-border effects;
- d. The resources and conditions required to maintain parks and conservation areas should also follow the creation of those areas. In case such resources are not available, those areas may easily be invaded.

Although such propositions may seem quite frustrating for those who have an advocacy perspective on urban environment, one may not ignore the effective conditions of policymaking in Latin American countries. The enforcement of laws, regulations and norms should not be taken for granted. In such a context, expansion of poor peri-urban areas contributes to an endless process of irregular land-use and environment degradation.

2. Transportation

The environmental impacts of transportation technologies are clearly understood at different levels, from global warming to heavy traffic jams and urban pollution (Elsom, 1992). However, transportation policies are also connected to other different urban environmental elements, including the shape of the city and the occurrence of settlements in distant areas and more remote suburbs.

Most of the tradeoffs between densification and sprawl can be framed in terms of long-term transportation strategies (Duany, Zyberk and Speck, 2000). On the one hand, high urban density—often regarded as a negative environmental characteristic of some urban areas—favors mass transportation systems such as the subway, which significantly reduce traffic jams and air pollution. Highway building, on the other hand, strongly stimulates urban sprawl (and lower density), with high environmental costs in terms of pollution, extending land occupation and increasing the costs of other public policies.

Although part of the modern environmental planning criticizes high urban density on quite logical technical grounds (Platt, 1994; Sporn, 1985; Roseland, 1997), it should be noted that low density seems to be a kind of luxury that most developing metropolises are not ready to afford. Population density can produce considerable economies of scale for different public policies, including education, urban infrastructure, sanitation and public health (Martinez, 2006).

Population density also reduces air pollution and precarious land occupation in the far suburbs. Such a counterintuitive perspective on environmental planning is not built upon any previous notion of what a city should be, but rather on what the already messy developing country metropolises are. In such places, land occupation is not well organized at all, and resources are dramatically limited.

It is nevertheless very difficult to influence transportation policies in the long term, regardless of their key role for the overall metropolitan planning, and their obvious impact on urban density. It mobilizes a complex set of individual and business interests, including developers, the construction industry, the auto industry, retailers and landowners, as well as the middle and upper classes that demand more urban space and environmental quality.

In brief, it is quite clear that transportation policies—particularly mass transportation—can strongly influence the sustainable use of urban space, stimulating or refraining peri-urban expansion in the long run. The challenge lies in conceiving a positive arrangement of political forces that will allow long-term transportation planning to counterweight urban sprawl, and lead to a more appropriate use of urban space, social equipment and urban infrastructure.

3. Housing policy

Housing policy is yet another dimension clearly connected to the sustainable use of space in urban areas. Such policy—trying to provide affordable housing for poor people—can engender important transformations in the city landscape, as well as influence intra-urban migration movements. Although the meaning of the so-called “housing deficit” is still the subject of some debate, the unattained housing demand is unquestionably very high in Latin America (Arriagada, 2000). Of course, poor peri-urban areas have to be considered among the most important priorities to be addressed by such policies.

Effective housing policies are very important not only because of their straightforward social impact, but also due to the series of positive outcomes on health, employment, and land regularization. But to account for their demographic and environmental consequences, these policies should also consider other general elements:

- a. Broadly speaking, housing policies seem to reduce urban environmental degradation because they increase overall sanitation and housing conditions, as well as regularize invaded public areas. However, depending on the engineering of the project and its institutional framework, it may produce important local environmental impacts in terms of land use and migration;
- b. Most likely, small scale projects will produce lower environmental impacts and more easily ensure the integration of the population within the metropolis. Whenever possible, new housing should also be close to existing social equipment, employment, and urban infrastructure to reduce both the living costs for the population and the overall costs for the government (i.e., building of new schools, roads). On the other hand, well located, smaller projects tend to be quite expensive due to their limited economies of scale and the price of the land;
- c. The execution of housing policies should be local to ensure consistency with the policy on land use. When this is not the case, national and state governments should also coordinate their investments locally in order to reduce possible unintended environmental and/or migration impacts;
- d. The lack of resources should not be considered a definitive impediment for housing policies. If it is true that housing is a very costly social policy, it is also true that alternative policies must be considered. For instance, land regularization and credit for small home improvements (i.e., self-construction) may be regarded as important and less costly alternatives.

It is important to take into account that—due to the low average family income in some metropolitan areas—such policies must also be partially subsidized to ensure that those who really need support will be targeted. This element, as well as the huge housing deficit, should discourage large scale housing policies, especially in a context of strong pressure for fiscal stability and budgetary control. Inaction, however, quite often translates into continuous peri-urban expansion, and the problems thereof.

With the exception of the Republic Chile, affordable housing for the poor is a distant reality in most Latin American countries. With expensive housing solutions and very few public housing programmes, poor families settle wherever they can (as opposed to where they choose)—which often means shantytowns and illegal settlements located in peri-urban and/or risk areas. The fact that peri-urban land tends to be less expensive and government controls and regulations weaker, makes it a more likely location for such settlements. In recent years, significant land price increases in some city centers further enhanced such trend (Torres and Gonçalves, 2007).

In other words, the need for a comprehensive housing policy in Latin American metropolitan areas seems quite obvious when considering the peri-urban phenomenon. Santiago, Chile, has pioneered actions in this respect, albeit with mixed results (Sabatini, 2004). This policy, however, should be developed without increasing the already significant migration movements and environmental impacts for those areas. Although only briefly presented here, these elements point to the need for national funding and local execution. Attention to the local conditions of urban infrastructure and social services, as well as to land use regulation, is essential to effect real improvement in the sustainability of land use.

F. PERI-URBAN INFORMATION DEFICIT

A major issue regarding peri-urban areas is that the people who decide where and how to provide their public services do not live there. In fact, neither do they necessarily belong to the same ethnic group, nor do they understand local social codes, language, behaviors, and values. As a consequence, the lower income population in peri-urban areas may become victims of the prejudices sustained by high- and middle-class public managers, who do not perceive them as preferential subjects for public policies. This hypothesis seems to be more appropriate to specific policies such as sanitation and urban infrastructure, as well as applies to the regions in which “the inheritance of an institutional culture biased towards inequalities” still persists (Werna, 2000).

In large urban regions, information systems are the best way of providing the lenses through which different areas and social groups are going to be seen, conceived and represented in the policy arena. However, as previously mentioned, many peri-urban areas are not properly registered by government making them less visible for public policies. Real estate databases, for instance, which are generally used for fiscal purposes, sometimes become the only consistent source of information to be employed by many Latin American city governments. In such cases, since they do not pay land taxes, residents of invaded areas “do not exist” in the city information system.

Other administrative data—dependent upon information systems on land, education, health, sanitation, etc. — are similarly biased by the particular conditions of data production, or by its institutional features. Four key elements lead to this situation:

- a. The institutional features of different social policies influence the production of administrative data. For example, forms and reports are often an additional burden to school principals that have to manage crowded schools with limited staff, equipment and training. The same is true for the many crowded medical facilities or public offices. As a general rule, this kind of administrative data is of worse quality in peri-urban areas;
- b. Even when a public database is capable of gathering information on poor peri-urban dwellers, significant amounts of data are likely to be missing from their individual records. Address records tend to be worse because people often misreport it either due to their own low schooling level and/or because the “street” is new (in an invaded area, perhaps) and a zip code has yet to be defined for it;⁷
- c. Administrative data production is fragmented between different government branches and levels. Each department and secretariat may have its unique perspective regarding information systems and geographic units for service planning and provision. The education department, for instance, does not necessarily cross its information with other departments, and many times even the geographic units through which data is organized are not compatible. The result is massive miscommunication — while one particular branch of the government may be aware of a certain recent settlement, this information is not necessarily available for the government as a whole;
- d. In Latin America, traditional demographic databases — especially birth records — tend also to underestimate the poorest population, making them invisible for several public policies, and even more so in peri-urban settlements.

As a consequence, census data are particularly important because they comprise the only truly universal database not dependent on one particular public policy, and as such can provide precious information about the people and the areas specific policies are unable to cover. In other words, censuses — especially when they are organized in census tracts and geographic information systems (GIS)—must be regarded as remarkable tools for supporting social policies at the local level. Even though this may seem

quite obvious, evidence strikingly shows that such handling of information is not at all present at the local level in some of the most important Latin American metropolitan areas, particularly when it requires more disaggregated formats or the help of GIS tools to be usefully employed.⁸

Ongoing peri-urban expansion is therefore happening within an environment that lacks adequate information systems and informed data analyses. In order to significantly reduce inequality in service access, analyses on the most important socio-demographic urban trends must nevertheless be based on highly disaggregated information, more frequently rendered available by GIS and satellite images. In view of that, local managers in Latin America need urgent support to implement information systems capable of coping with the new demand for local disaggregated information.

Systems of this kind allow analysts to reflect on one of the most complex issues of urban administration—the dilemma of “where to act” (Torres, 2002a). Territorially disaggregated information enables analysts to identify both those areas with greater distortions between supply and demand and those that present cumulative negative social indicators, or that are segregated in terms of residence, such as poor peri-urban expansions.

This problem has been traditionally addressed through political representatives and/or social movements. In this model of demand management, those areas (and groups) that succeed in having their request heard sooner by public authorities become the recipients of public investment. The distribution impact of such a dynamic is obviously strong: those less informed and organized usually have fewer chances of expressing their needs and of reaching different government levels.

With widespread information and more accurate socioeconomic indicators, the general public, government officials and the poor themselves can have access to public policy demands regardless of whether they have been successfully voiced or not—for instance, through public information systems such as the Internet. By doing so, they may help prioritize those policies in a more informed way. Unfortunately, those systems are far from available. As to census data, it tends to become outdated rather quickly, particularly in regard to fast growing areas.

Those social policies indicators needed the most at the local level are generally well known and established in the different social policy fields, i.e., school enrolment (education), sewage coverage (sanitation), infant mortality (health). Teams in each one of these fields are generally aware of those indicators and eventually assess some aspects of their respective policy by using them. This kind of data is rarely available in a disaggregated format, though.

Local social policy managers of peri-urban areas need additional elements of an information systems agenda. Above all, they need to understand the demographic trends that are reshaping the area of influence of the social equipment they oversee. Poor peri-urban settlements and shantytowns are areas that typically present fast demographic expansion. Having detailed information on population growth and distribution at the local level for developing metropolises is therefore essential to provide for people’s needs, for instance, health care facilities or primary schools. This information is however often unavailable, particularly during inter-census periods.⁹

The gap between two censuses is in fact a major problem regarding accurate information. The lack of data on urban areas under strong demographic pressure experienced by local governments may not only be due to poor administrative processes—after all, public policies have not reached such areas yet—but also the consequence of an information gap, particularly if it occurs in between two censuses. In some cases, demographic projections for small areas can be used to estimate how fast a neighborhood is growing, but these are not very reliable because they tend to be based only on the major components of the demographic dynamics (fertility, mortality and migration). For such projections to be more accurate,

they need to be built upon some hypotheses about particular urban trends that depend on major public and private investments, such as new roads and large housing developments.

In our view, the best approach to address this situation would be developing early warning indicators, as opposed to generating complex projections for small areas, which require non-existent local expertise. Such indicators can help local policymakers anticipate situations that otherwise may run completely out of control for both the public administration and the society as a whole (Banerjee, 1996).¹⁰

A lot of data are being produced daily in a metropolitan area—traffic flows, new housing approvals, garbage collection, areas with delay or default in utilities payment and civil records, to name but a few—which may be processed and handled as early warning indicators of urban processes that are happening in connection to demographic growth, change in land use and decay of specific areas.

Analysts may also resort to aerial photographs and satellite images to detect transformations in peri-urban areas (Angel, Sheppard and Civco, 2005). Recent improvements in image quality and new technologies for data handling, such as the so-called “object-based GIS,” are opening new roads in this field, with significant potential in terms of helping governments identify previously undetected urban expansions, as well as produce qualitative information regarding housing density and building patterns (Ehlers, Michel, Bohmann and Tomowski, 2006).

Such technologies unfortunately remain quite alien for most city governments. Satellite images are costly, and the technology involved is neither simple nor readily available. International organizations could substantially help Latin American governments by supporting them to put in place the technology and satellite images required to allow different cities in developing countries to identify more recent urban expansions.

In a recent field work, for instance, we found municipal officials of a large Latin American city using “Google Earth” website with the purpose of identifying public building coordinates and assessing general urban expansion trends. Although quite helpful, the images are not always updated, and are unable to provide information on changes over time.

In order to cope with this demand, some organizations are trying to produce data and indicators in regional intra-urban scales. There is a movement towards the development and use of “poverty mapping,” which would allow better policy targeting and rapid food security initiatives (United Nations Environment Programme, 1998; CIESIN, 2006). At the same time, public agents, international bodies and professional groups from several countries are focusing on building indicators through GIS tools to act as a basis for regional and urban public policies. Despite these laudable initiatives, there is still an important gap to be fulfilled, particularly when we look at the problem from the point of view of local administrations.

In summary, in order to tackle the issues pertaining to poor peri-urban areas, the quality of government information systems and their data on low income settlements must substantially increase. Peri-urban shantytowns and illegal settlements are an uncomfortable reality that many public officers, backed by antiquated information systems, insist on ignoring. In order to start addressing these issues, it is essential to reduce the existing information gap.

G. CONCLUSION

The image of a “planet of slums” has daunted the imagination of important observers of the international urban scene (Davis, 2006). According to this vision, growing world urbanization would be followed in developing countries by a massive spread of peri-urban slums and shantytowns, within areas

fraught with unemployment, violence and despair. Such an apocalyptic perspective raises at least one critical question: is this really a necessary outcome for Latin American cities?

Not quite. Although the idea of an urban crisis seems to be a fact for many Latin American urban areas during the 1980s and 1990s, there are also some important signs of hope. It is worth mentioning the strong urbanization initiatives in peri-urban Bogota, which have significantly reduced crime and social insecurity; the comprehensive housing programme that the Chilean Government has been implementing since the 1990s; the significant increase in housing solutions provided to low-income families by private companies in Mexico; and the impressive change in Brazilian's legal procedures regarding land regularization and property rights (Fernandes, 2007). All these initiatives address different key issues in terms of urban conditions, and are evidence that the region is indeed moving forward.

Significant improvements in peri-urban conditions will most likely depend on a set of coordinated initiatives. In the case of housing programmes, for instance, although government funding is essential, particularly for the poorest social groups, unleashing the potential of private markets is also required to provide housing for low-medium income families – a move that is already in place in the Republic of Chile and Mexico. In order to follow suit, other Latin American countries will also have to review their legal frameworks to enable property to be reclaimed and used as collateral, which Brazil has just started to do. Different urbanization initiatives may also help provide accessibility, security and better environmental conditions that can significantly transform the living conditions of numerous families.

While the challenge is enormous, the signs of change can already be perceived. A combination of three other socioeconomic dimensions is currently contributing to Latin American urban transformation. First, the region has been experiencing the best economic conditions ever to take place within one generation, with significant reduction in income inequalities (ECLAC, 2008). However, the recent economic crisis is a substantial reason for concern. The improved economic conditions result in better funding for housing policies and the overall capabilities of families to invest in their homes (i.e., by both acquiring property and remodeling existing ones). Second, many Latin American cities—particularly larger ones—are being confronted with urban transition and fertility decline, indicating a less intense overall metropolitan population growth in the near future. Finally, democracy is also a reality for most Latin American countries, and in spite of controversies, it makes governments more aware of the living conditions of their constituents, including the very poor.

The way ahead is far from easy. Even though informed housing policies and projects are able to change general social conditions, as in the case of the Republic of Chile, income inequalities are still the norm, and democracy remains fragile, if not an illusion, in some countries. The information gap regarding urban expansion still persists, and will have to be addressed to allow for broader changes in the peri-urban landscape.

NOTES

¹ Sabatini (2004) argues that although some wealthy enclosed neighborhoods will grow at a small fraction of the peri-urban region, especially in those areas adjacent to previously rich neighborhoods, most of the peri-urban area in Latin American cities will remain poor.

² United Nations Population Fund, 2007.

³ In Latin America, a number of countries have experienced such changes—albeit at different rates and with different decentralization models (Finot, 2002, p. 2005)

⁴ Census data may reduce this kind of problem only when they become available at a highly disaggregated scale (i.e., census tracts) and are entered into a GIS system so as to allow local administrators to identify under-recorded locations. We further discuss this issue at the end of this paper.

⁵ Peri-urban regulation in Santiago was based on extensive housing programmes, a process that is nevertheless followed by other social malaises (Sabatini, 2004).

⁶ “To avoid adding to the backlog of problem housing and neighborhoods, new developments must meet basic – but not excessive – compliance standards” (World Bank, 1999, p. 146).

⁷ Ironically, having a zip code is a form of hidden citizenship not clearly understood by most database practitioners.

⁸ “In most countries, the needed information is available through completed censuses and surveys, and the amount of work required to compile the information is manageable and affordable (...) New technologies have made it easier and cheaper to process data and understand its spatial implications. If this information exists, why is it so difficult to access? Most cities have local planning offices or economic bureaus whose role is to collect and process statistical information about the city. But the census and survey data routinely collected at the national level are typically not available to local offices, at least not ready in a usable form. In other cases local offices collect basic demographic and production statistics, but these data are transmitted directly to the national capital and are not analyzed locally, either because local economic officers do not have the skills or resources, or because the city’s decision makers do not demand the information” (World Bank, 1999, p. 138).

⁹ “Will there be enough land to support urban development? Will the prevailing patterns of population and housing density continue into the future or are there alternatives to urban development that require less land? How can agricultural land surrounding cities be preserved without driving the price of land beyond the low- and middle-income households? (...) The first (impediment to address the issue) is the absence of a workable model with which to understand the land market. The second is the lack of accurate and up-to-date information about urban growth” (Dowall, 1994, p. 24).

¹⁰ “Effective management of regional growth without sacrificing productivity or public health requires a strategic rather than a deterministic approach. It will certainly require new institutional capabilities and management tools. Future institutional responses should include an “early warning” system for continually monitoring and reviewing infrastructure stress and developing strategic capabilities for coping with such stress” (Banerjee 1996, p. 62).

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THE CHANGING NATURE OF URBAN AND RURAL AREAS IN THE UNITED KINGDOM AND OTHER EUROPEAN COUNTRIES

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The main focus of this paper is on urban/rural patterns of population change and migration since the 1980s. Particular attention is given to the results of new research on the United Kingdom, but the main findings of selected studies of other parts of Europe are also reviewed and discussed. The paper begins by putting European urbanization in the global context.

A. EUROPEAN URBANIZATION IN CONTEXT

In 2000, Europe had a total population of 729 million. Europe's population increased by nearly 73 million between 1970 and 2000 (United Nations, 2008). In 2030, the region's population is projected to decline to 698 million, that is, it is expected to fall by 30 million or 4.2 per cent between 2000 and 2030. By contrast, the world population rose by 65 per cent between 1970 and 2000 and is projected to grow by a further 35 per cent by 2030. As a result, Europe's share of world population has shrunk markedly, from 17.7 per cent in 1970 to 12.0 per cent in 2000 and is projected to fall to 8.5 per cent in 2030.

In terms of the urban/rural distribution, the situation in Europe is one of urban growth and rural decline. In 1970-2000 the continent's urban population grew by 111 million (a 27 per cent increase), while its rural population contracted by 39 million (a 16 per cent fall). In 2000-2030 the urban population is projected to increase by 24 million (4.7 per cent) and the rural population is expected to decline by 55 million (27 per cent). Thus, while the decline in rural population is accelerating, urban population growth is slowing down. Europe's share of the world's urban population is projected to be 11.1 per cent in 2030, down from 18.4 per cent in 2000 and 30.9 per cent in 1970. Its share of the world's rural population is expected to decline somewhat more slowly (10.4 per cent in 1970, 6.4 per cent in 2000 and a projected 4.6 per cent in 2030).

The combination of urban growth and rural decline produces a continuing rise in Europe's overall level of urbanization. Though the strongest urbanization took place in the 1950s and 1960s (with an annual average urbanization rate in excess of 1 per cent taking its level from 50.5 per cent in 1950 to 62.6 per cent in 1970), the proportion of population living in urban areas reached 69.3 per cent in 1985 and 71.7 per cent in 2000 and is projected to rise further to 73.9 per cent in 2015 and 78.3 per cent in 2030. Across the region, such growth is driven by the reclassification of territory from rural to urban status and (usually) by higher urban than rural population growth for the areas that have not changed status.

There are still substantial differences among the four regions of Europe, even though such differences decline as urbanization levels rise above 75 per cent. Northern Europe (comprising the Nordic and Baltic states together with the British Isles) continues in the vanguard of urbanization, with an urban population share of 83.4 per cent in 2000, up from 73.1 per cent in 1970 and projected to reach 87.4 per cent in 2030. The proportion of urban population reached 76.2 per cent in 2000 in Western Europe, up from 71.6 per cent in 1970 and is projected at 82.6 per cent for 2030. In Southern Europe (Spain, Portugal, Italy, Greece and the countries of former Yugoslavia), the proportions are 57.6 per cent in 1970, 65.4 per cent in 2000 and 74.4 per cent in 2030, while those for Eastern Europe (which includes, among other countries, the Russian Federation) are 56.2 per cent in 1970, 68.3 per cent in 2000 and 73.7 per cent in 2030. By country, the highest levels of urbanization in 2000 were recorded in Monaco, Holy See,

Gibraltar (100 per cent) Belgium (97.1 per cent), Malta and San Marino (93.4 per cent), Andorra (92.4 per cent) Iceland (92.3 per cent), United Kingdom (89.4 per cent) and Denmark (85.1 per cent). Some of the differences among countries are not “real” but arise from differences in the definitions of urban and rural.

Given these trends, it is perhaps not surprising that little interest is shown across most of Europe in the precise levels of urbanization or in the now quite low rates of urbanization as measured in terms of the percentage change in the level. This is compounded by the erosion of differences between urban and rural areas in terms of economic structures, social composition and quality of physical infrastructure such as roads, power and other utilities. The relevance of the traditional rural/urban dichotomy has also been weakened by the blurring of distinctions at the edge of individual urban areas, as improvements in personal mobility have allowed people to move out of these agglomerations into the surrounding countryside without losing access to the jobs and services located in them. For further details of these changes and their implications see Hugo and others (2004), Champion and Hugo (2004) and Champion (2007).

While there is still interest in settlement size, the focus is not as much on the differences between urban and rural areas as on the distribution of population across settlements of different sizes, ranging from the largest conurbations to the small town, village and hamlet. This is primarily because of the differences in the number and diversity of people, jobs, services and other amenities found in settlements of different sizes, which are generally much greater than between urban and rural aggregates. On the other hand, even more important for the opportunities available to residents in a mobile society is the geographical context within which the individual settlements are situated, this being influenced by the overall “intensity” of settlement in the wider area and by distance to larger urban centres (see, for instance, Coombes, 2004). This accounts for the increasing use of functional criteria to define settlement systems and for the strong focus on urban/rural relations and networking in more recent European spatial planning (European Commission, 1999).

B. THE CASE OF THE UNITED KINGDOM

The United Kingdom provides a particularly good example of the way in which attitudes and approaches have developed, owing to the early date at which it urbanized. Following the definition of “physical agglomeration” recommended by the United Nations, Law (1967) revealed that, even by the first census in 1801, one-third of the population of England and Wales was in urban areas. By 1851 the proportion had exceeded half and by 1901 it had grown to 78 per cent, considerably above the current European figure. The proportion of urban population rose by just 11 percentage points during the twentieth century. This section looks first at the latest information on settlement size and then at population trends since 1990 on the basis of an urban/rural classification of local authority districts.

1. Population by settlement size

This section examines the distribution of population by settlement size and the way in which recent population growth has varied by settlement size. The analysis is based on the “urban area” principle, where “rural” is the residual and its definition is flexible depending on what settlement size cut-off is used. Table 1 shows the distribution of the 2001 Census population of Great Britain (i.e. all United Kingdom except for Northern Ireland) by settlement size. If all the people living in the physically-defined “urban areas” are considered to be urban, then the level of urbanization is 92.9 per cent, and just 7.1 per cent of the population is living in non-urban areas. Defining urban settlements as those with 10,000 residents or over, as the department responsible for rural affairs in England, that is, the Department for Environment, Food and Rural Affairs (DEFRA) defines them, results in just over one-fifth of the population being “rural”. This form of presentation thus allows users to select the size-based definitions

of “urban” and “rural” that best match their requirements, something that is especially useful in trying to make comparisons with other countries that also use settlement size as their criterion.

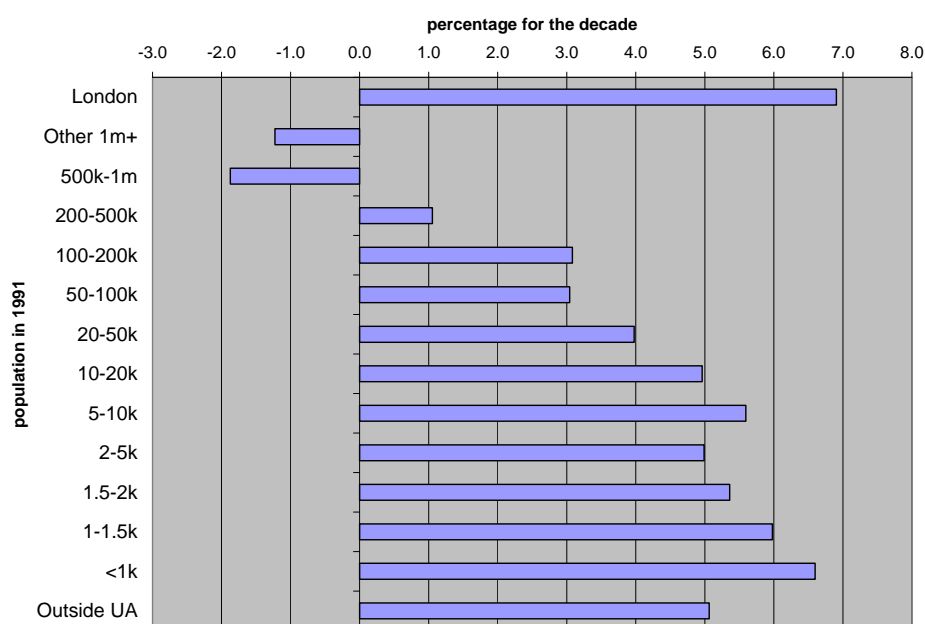
TABLE 1. POPULATION OF GREAT BRITAIN, 2001, BY POPULATION SIZE OF SETTLEMENT

<i>Urban area (UA) size</i>	<i>Population</i>	<i>Per cent of population</i>	<i>Cumulative per cent</i>
1 000 000 and above	15 475 010	27.1	27.1
500 000 – 999 999	3 554 356	6.2	33.3
200 000 – 499 999	7 332 922	12.8	46.2
100 000 – 199 999	5 402 465	9.5	55.6
50 000 – 99 999	4 361 740	7.6	63.3
20 000 – 49 999	5 451 565	9.5	72.8
10 000 – 19 999	3 365 573	5.9	78.7
5 000 – 9 999	2 746 740	4.8	83.5
2 000 – 4 999	2 728 752	4.8	88.3
1 500 – 2 000	721 342	1.3	89.6
1 000 – 1 499	845 587	1.5	91.0
Under 1 000	1 067 490	1.9	92.9
Outside UA	4 050 396	7.1	100.0
Great Britain	57 103 938	100.0	N/A

Source: 2001 Census, Key Statistics for Urban Areas. Crown copyright data.

In order to observe trends over time, estimates that attempt to harmonize definitions and methodology between censuses are necessary. Namely, the level of under-enumeration has varied between censuses. In 2001, for instance, students were counted at their term-time rather than vacation address for the first time; this shifted this group up the urban hierarchy to the larger towns and cities that contain the majority of colleges and universities. Based on harmonized estimates compiled by Norman (2007), figure 1 shows the 1991-2001 population change rate for the urban areas of England and Wales grouped on the basis of their estimated size in 1991.

Figure 1. Population change, 1991-2001, England and Wales, for 2001 Census urban areas grouped by population size in 1991



Source: calculated from data provided by Norman (2007).

Figure 1 reveals a general shift of population down the urban size hierarchy. Urban areas with between 500,000 and 5 million residents in 1991 experienced population decline between 1991 and 2001. The percentage change rises fairly systematically with falling settlement size until reaching its peak of 6.6 per cent for urban areas with under 1,000 residents in 1991. Even the territory that still lay outside the officially defined urban areas in 2001 is estimated to have averaged 5.1 per cent growth. The one glaring exception to this general “counter-urbanization” pattern is provided by London’s urban area with its 6.9 per cent estimated growth for the decade exceeding that of all the other size categories.

2. Population change by urban/rural district type

Out of the several classifications used by local authorities, the most appropriate to analyze population changes is the “district classification” used by DEFRA, which has six main categories based on a combination of size of urban area and proportion of people living in rural settlements (see note to table 2). The classification is restricted to England, which accounts for five-sixths of the population of the United Kingdom. Table 2 shows population change and its two main components, natural increase and migration, for England under this classification (with London shown separately from the other Major Urban districts) for three five-year periods from 1991 to 2006.

TABLE 2. POPULATION CHANGE RATE, 1991-2006, ENGLAND, BY URBAN/RURAL DISTRICT TYPE (PER CENT/YEAR)

<i>Urban/rural classification of LA districts (see text)</i>	<i>Overall change</i>			<i>Natural change</i>			<i>Migration</i>		
	<i>1991- 1996</i>	<i>1996- 2001</i>	<i>2001- 2006</i>	<i>1991- 1996</i>	<i>1996- 2001</i>	<i>2001- 2006</i>	<i>1991- 1996</i>	<i>1996- 2001</i>	<i>2001- 2006</i>
England	0.27	0.38	0.53	0.22	0.16	0.21	0.05	0.22	0.32
London	0.41	0.93	0.50	0.52	0.57	0.69	-0.11	0.36	-0.19
Other Major Urban	-0.12	-0.22	0.29	0.22	0.15	0.22	-0.34	-0.37	0.07
Large Urban	0.17	0.04	0.37	0.15	0.07	0.11	0.02	-0.03	0.26
Other Urban	0.29	0.42	0.53	0.33	0.24	0.27	-0.04	0.18	0.26
Significant Rural	0.35	0.36	0.66	0.17	0.10	0.11	0.18	0.27	0.56
Rural-50	0.44	0.59	0.67	0.02	-0.05	-0.05	0.41	0.63	0.72
Rural-80	0.55	0.77	0.87	-0.03	-0.09	-0.10	0.58	0.86	0.97

Source: calculated from annual population estimates and components of change data published by the Office for National Statistics. Crown Copyright data.

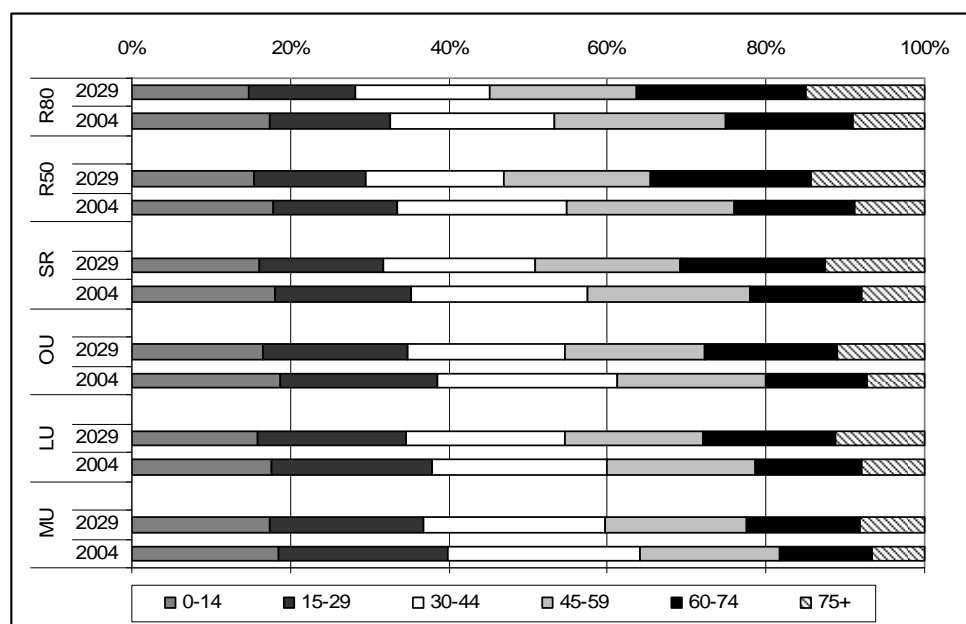
NOTE: London comprises all local authority (LA) districts with at least 50 per cent of population living in the London urban area. Other Major Urban are urban areas with at least 750,000 residents at the 2001 Census and Large Urban are urban areas with at least 250,000 residents. The three rural types are split according to the proportion of the LA district population that is deemed “rural”, defined as settlements of less than 10,000 residents together with “market towns” with no more than 30,000 residents— at least 80 per cent for Rural-80, at least 50 per cent for Rural-50 and at least 26 per cent for Significant Rural. Other Urban comprises the remaining LA districts.

As regards overall change, most districts experienced the highest growth rates in the most recent period (2001-2006), and so did England as a whole. In contrast, London grew fastest in 1996-2001, and, in both the other major and large urban categories, the growth rate declined in 1996-2001 and increasing afterwards. Overall, there is a “counter-urbanization” pattern, with rates rising with declining settlement size—except, again, in the case of London (see previous section).

Regarding the two components of population change, table 2 shows that both natural increase and migration were highest in 2001-2006. Migration is clearly the main driver of overall change: migration rates increased through the period in the four most rural district types, paralleling national experience. As for natural change, only London displays a progressive increase across the three decades. In the other urban categories, natural increase follows U-shaped pattern, while in the two most rural types natural increase falls across the three periods.

The steepening gradient between degree of “urbanness” and natural change rate shown in table 2 is primarily related to the increasing disparity in age composition between urban and rural areas, which in its turn is reinforced by the age profile of migration. Based on data from the latest official projections, figure 2 shows that the proportion of residents aged 60 was higher in rural district categories in 2004, and that the difference between the rural and urban categories widens over the following 25 years, assuming a continuation of current trends in migration, fertility and life expectancy. By 2029 it is projected that over one-third of people living in the rural-80 districts would be 60 and over, compared to less than one-quarter of those in major urban areas.

Figure 2. Age composition of England’s population in 2004 (estimated) and 2029 (projected), by urban/rural district type



Source: Calculated from 2004-based sub-national Population Projections for England, Office for National Statistics. Crown copyright data.

The role of migration in these changing age structures has been explored by Champion and Shepherd (2006). Interestingly, while there is some net migration of people aged 60 and over from more urban to more rural areas, its contribution is much smaller than that of three other factors. The most important one is the urban exodus or “counter-urbanization” of people aged 30-44 and, to a lesser extent, those aged 45-59, who stay in rural districts and age there. Secondly, more rural areas are major net losers of school leavers (with over 50 per cent net decline of persons between ages 16 and 24 recorded by more remote rural communities), who head for cities of 100,000 residents or more that offer further and higher education and a greater range of job opportunities. Thirdly, this rejuvenation of large-city populations is reinforced by these places acting as the main destinations of working-age migrants from outside the United Kingdom.

These migration patterns—notably the concentration of net immigration on the larger cities and the urban exodus that is predominantly born in the United Kingdom and white—are also serving to increase urban/rural differentials in racial and ethnic composition. The London urban area now accounts for almost half of all England’s non-white population, almost three times its share of all people. By contrast, the parts of England lying outside the 56 largest urban areas are home to barely one-eighth of all non-white

people, three times less than their 42 per cent share of national population (Champion, 2006). Thus, while most of the differences between city and countryside in economic structure, occupational composition and quality of life have been diminishing over time, urban/rural gradients are steepening for some key demographic characteristics like age and ethnicity.

C. THE WIDER EUROPEAN SCENE

This section relies on a selection of English-language studies that attempt to review the situation over large parts of Europe. These have been chosen to represent the main areas of interest that research has addressed since the start of the twenty-first century. The first section addresses the concern about the future of Europe's larger cities, asking whether there seems to have been any significant degree of "resurgence" in the growth of these cities since the "counter-urbanization" process started in parts of Europe in the 1970s. Next, the results of some national studies of urban system change are examined in order to detect change over time in population concentration and deconcentration trends. The third set of studies looks at evidence of the existence and progress of urban sprawl in different parts of Europe, with primary emphasis on more localized patterns of development within cities and their regions.

1. Resurgent cities?

According to Storper and Manville (2006), "For almost as long as we have had cities, we have predictions of their decline and, for almost as long ... we have had prophecies of resurgence" (Storper and Manville, p. 1269). Recent years have seen the latter in the ascendancy, with cities being identified as sites of renewed economic dynamism and engines of national prosperity (OECD, 2001; Parkinson and others, 2006). This view of cities has been endorsed at national and European policy levels to the point where it has been described as "a new conventional wisdom" (Buck and others, 2005). Yet there has tended to be more urban myth and policy hubris in the debate than there is hard evidence (Cheshire, 2006). Hence the value of an ambitious study by Turok and Mykhnenko (2007) to chart the population-change trajectories of 310 urban agglomerations with at least 200,000 residents in 36 European countries over five-year periods since 1960, these accounting for over one-third of these countries' aggregate population.

The headline results of the Turok and Mykhnenko study are that the number of growing cities has been falling steadily since the 1960s. Nearly three times as many cities were growing in the late 1960s compared to the late 1990s, by which time there were more cities in decline than growing. The picture looks a little different if the population change rates of cities are standardised to the change rates of their countries at each period, so as to allow for the long-term downward shift in national growth produced mainly by falling birth rates. The number of cities that were growing faster than their national rates fell from 241 in 1960-65 to 128 in 1995-2000, with those experiencing relative decline rising from 69 to 182. The only positive sign at this aggregate level was evidence of a slight recovery in 2000-2005, when 145 cities were growing faster than their national populations, but it is rather early to assess whether this modest rebound will continue.

In terms of the cities' individual trajectories measured in terms of the direction of population change, Turok and Mykhnenko (2007) were able to allocate 291 of the 310 (94 per cent) cities into one of 9 types. Three of these represented different types of "resurgence" involving a change from decline to growth: 12 cities had experienced resurgence just in the final period 2000-2005, a further 7 since the end of the 1980s and 23 turning around between the 1970s and 1980s. In all, therefore, only one in seven cities saw an absolute revival, with over half these events occurring as long ago as the 1980s. On the other hand, a total of 94 cities were found to have registered continuous growth over the study period, making this the largest single type of trajectory. Meanwhile, in terms of the 4 declining types, 5 cities were characterised by continuous population loss since the 1960s, 8 since the 1980s, 75 by the 1990s and 41

just in the last five-year period. The remaining 26 cities, mainly East European, had grown in the 1980s, declined in the 1990s and then returned to growth after 2000.

The study also found a major difference in the general trend over time between Western and Eastern Europe. The latter was, in aggregate, characterised by very strong growth in the 1960s and early 1970s, somewhat slower growth in the following decade and then absolute decline since the mid 1990s. By contrast, the trajectory for Western Europe's cities is seen as much less dramatic, with a lower average growth rate in the 1960s, followed by an earlier slowdown than in Eastern Europe but then with a period of aggregate recovery in the late 1980s and another since 2000. Perhaps the starkest difference between East and West is the fact that between 2000-2005 no less than 78 per cent of the latter's cities were growing then while 82 per cent of the East European cities were in decline.

Taking the long term view therefore, the overall verdict is that city population growth has waned over the last three decades. This is in relation to their past trajectories and also relative to smaller urban and rural areas. In the shorter term, several indicators suggest something of a recovery since the late 1990s, which was the weakest period for European cities overall, partly because they were dragged down by the Eastern cities. While it is too soon to say whether this uplift will be any more enduring than the temporary one in the early 1990s, one potentially important development identified by Turok and Mykhnenko (2007) is that, on average, the larger cities are now seeing somewhat faster population growth than the smaller ones, reversing the negative relationship between size and growth that had pertained all through the study period till the mid 1990s.

2. National analyses of urban system change

Studies of individual countries are much more common than cross-national investigations and, though they can differ markedly from each other in the way in which urbanization is defined and measured, they can help to build up a broad picture of the changes taking place. This is especially the case where such studies have had a degree of central co-ordination, as for a journal special issue or a book. This section focuses primarily on the findings of two such projects, namely a set of studies aimed at testing the "differential urbanization" model (Kontuly and Geyer, 2003a) and studies of urbanization and migration published in an *International Handbook of Urban Systems* (Geyer, 2002). In both these cases, the emphasis is on trends of urban concentration and deconcentration analysed for functional urban regions rather than physically-defined agglomerations.

The differential urbanization model posits a cycle of urban system development that progresses through a temporal sequence of three primary stages defined on the basis of the relative growth of three size groups of cities (with growth preferably measured in terms of net migration rate rather than overall population change). On this basis, "urbanization" is said to be occurring when the large cities are, in aggregate, growing faster than both the medium-sized and the small ones, while "polarization reversal" occurs when the medium-sized cities outpace the others and "counter-urbanization" is when the small cities are in the ascendancy. In their journal special issue, Kontuly and Geyer (2003b) summarise the results of nine national case studies, six of which are for European countries

Taking these six countries in order of progress made through the stages of the model up to the 1990s, Finland emerges as the most advanced. Though urbanization began fairly late here compared to other European countries, progress was rapid, with the migration differentials signalling polarization reversal by 1955-1965 and counter-urbanization by 1965-1975. Then after a number of years in which net migration rates for all three urban size classes were roughly equal, a second cycle of urbanization emerged in 1990-1998.

Focusing on the period since 1950, the United Kingdom was found, on this basis to have been in the counter-urbanization stage throughout, with no second cycle evident at least up to the end of the study period in 1991. Western Germany, like Finland, advanced rapidly through all three stages between 1950 and 1987, but then reverted to polarization reversal. Estonia spent four decades in the urbanization stage before leaping forward to counter-urbanization in the 1990s. Italy switched from urbanization to polarization reversal around 1971, while Russia reached this point around 1989.

Europe accounts for eight of the national case studies in Geyer (2002): the United Kingdom, France, Germany, the Netherlands and Italy as representatives of “Western Europe,” and Finland, Poland and Romania as examples of “Nordic and Central Europe.” Taking these in reverse order and focusing on those not covered by Kontuly and Geyer (2003b), Romania has progressed through an entire cycle of urban evolution during the twentieth century, beginning with a prime city phase centred around the capital city, followed by a shift in importance to the regional centres, then to the intermediate and small towns, and most recently to a revitalising countryside, marked by a decrease in urban population since 1996 (Ianoş, 2002). In the Polish case (Rykiel and Jażdżewska, 2002), there has been no period in the past half-century when prime cities dominated the urban system, but the predominant pattern of migration has been up the urban hierarchy, taking advantage of the much superior living conditions in the more urban areas. After 1980, however, economic crises and social unrest caused a switch in migration destinations from the large and medium-sized cities to smaller cities and towns and by the 1990s industrial restructuring and the expansion of the private housing market were being accompanied by an increase in urban-to-rural migration.

In Western Europe, the case of the Netherlands is most notable for the development of a polycentric urban structure in the centre-west part (Randstad) of the country that has been concentrating population at the national level (Nijkamp and Goede, 2002). Finally, three main tendencies are clear from Pumain’s (2002) treatment of France. First is the high intensity of the urbanization process in the two decades to 1975, this by comparison with both previous trends and neighbouring countries. Second is the persistence of concentration trends at the scale of daily urban systems, on which basis the level of urbanization had risen to 77 per cent by 1999, up from 61 per cent in 1968 and 69 per cent in 1982 (and compared to 73 per cent in 1999 on an agglomeration-based definition). Third is the deconcentration of population at the local level, which has meant that the population growth rate for the functionally-defined urban regions has for the last three decades been around twice the one measured on the agglomeration basis.

3. Urban sprawl

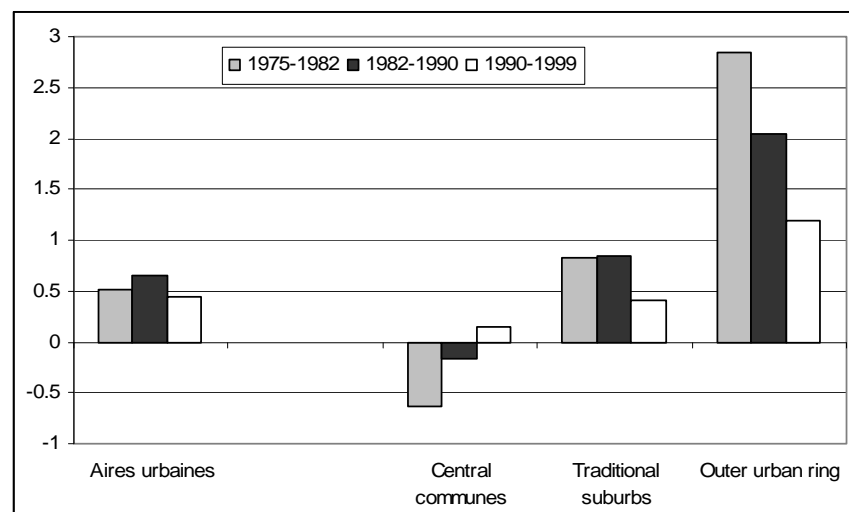
In contrast to the Anglo-American world, in continental Europe, sprawl is not traditionally associated with urbanization. A longer history of pre-industrial urbanization, generally less intense forms of industrialization and rather different views about the status of rural land ownership among the elites all tended to maintain the preference for city life and secure greater investment in infrastructure and amenities for the city than for the countryside. While this may be a gross oversimplification of the European scene, there is no question that the attraction of the high-density apartment lifestyle has waned considerably in recent years, with the construction of single-family dwellings, the growing attachment to the private car and the switch of industry to horizontal factory layouts and road haulage all contributing to an explosion of physical development around urban nodes and further a field. It has also led to an explosion of academic and policy interest that includes books on urban sprawl in Europe (Couch and others, 2007) and in Western Europe and the United States of America (Richardson and Bae, 2004), national case studies like Guérois and Pumain (2002) on urban sprawl in France and Haag (2002) on sprawling cities in Germany, and a number of investigations funded by the European Union (EU) including SCATTER, the Spatial Deconcentration of Economic Land Use and Quality of Life in European Metropolitan Areas (SELMA) and several projects under the European Spatial Planning

Observation Network (ESPON) programme. Here, this literature is drawn on selectively to attempt a summary account of this development, leaving space for an assessment of its implications for defining and measuring urbanization in Europe in the twenty-first century (see next section).

Given its “real predilection for urban centres and urban values” (Guérois and Pumain, 2002, p. 14), France forms a particularly good example of the extent and nature of recent changes. Even more impressive than the rising population share of the functionally-defined daily urban systems, noted in the previous sub-section, is their rapidly rising spatial coverage. As defined at each population census, the land covered by what are rather confusingly called “aires urbaines” increased more than five-fold in barely 30 years, rising from 32,733 km² to 100,218 km² in 1982 and reaching almost 176,000 km² in 1999. Generally, the number of urban centres used as cores for defining these areas has risen, but not hugely, up from 319 in 1968 to a peak of 361 in 1990. The main change has been the expansion of the daily urban system around each core, which has increasingly led to the merging of these systems, such that the total number of nodes actually dropped to 354 in 1999 (see Guérois and Pumain, 2002, p. 36, figure 7).

While the expansion of these daily urban systems in France can be linked to increasing journey distances for work and services by long-term residents of these “peri-urban areas,” it has also been associated with the deconcentration of residential populations from their cores. Since 1975, the patterning of population growth within these systems has remained very consistent, such that the further away from the centre, the higher the average growth rate. For example, in the intercensal period 1990-1999 and using the zones as defined at the start of this period, the annual rate for the outer rings averaged a gain of 1.19 per cent, compared with 0.41 per cent for the traditional suburbs (*banlieus*) and 0.15 per cent for the central communes. Figure 3 confirms that this pattern also existed in the two previous intercensal periods. On the other hand, it is also clear from this chart that the scale of the differential across the three zones has contracted considerably over time, especially since 1990. As part of this, a particularly impressive feature is the recovery of the central communes from substantial decline to modest growth over the period studied, with their improvement since 1990 moving against the trend for the “aires urbaines” in aggregate. According to Guérois and Pumain (2002, p. 26), this slowing down of urban sprawl can be linked to central cities ceasing to lose population, which though beginning before 1990, became much more common afterwards.

Figure 3. Mean annual population growth rate, 1975-1999, for France’s *aires urbaines* and three constituent zones (1990 definition)



Source: drawn from data presented by Guérois and Pumain (2002, p. 26, table 3).

The daily expansion of urban systems and residential deconcentration within them are also associated with shifts in jobs and services and with the emergence of a more polycentric urban morphology in France. For instance, between 1990 and 1999 the traditional share of employment in the suburbs rose from 29.4 to 30.7 per cent and that of the outer urban rings went up from 8.7 to 9.1 per cent (Guérois and Pumain, 2002, p. 31, table 4). The transformation of the functional spatial structure towards more complex patterns is coming about through the combination of absorption of previously existing secondary urban poles (including the effects of system mergers, see above) and the establishment of new nodes of economic activity, most notably located close to motorway junctions and airports. Nevertheless, as yet no secondary peripheral nodes have posed a real threat to the old city centre, “the concept of competing fringe cities has not been imitated from the US” (Guérois and Pumain, 2002, p. 38).

The picture of urban sprawl more widely across Europe is documented in the book edited by Couch and others (2007). In particular, a sample of 45 cities drawn from 18 countries are classified using the European Union’s Urban Audit estimates of the rate of 1991-2001 population growth of their conurbations (defined on the basis of “larger urban zones,” LUZ) and the change in the share of total LUZ population accounted for by the LUZ’s core city over the same period (see Reckien and Karecha, 2007, p. 46, table 2.4). “Sprawl,” defined in terms of a fall in the core’s proportion of the LUZ population, was found to be extremely common, accounting for 37 cases, leaving only 8 cases of “containment,” where the core was growing faster than the LUZ. The largest single group comprised the 25 cases that were sprawling and growing at the same time, this group being particularly well represented in Belgium, Netherlands, Austria and Germany. In second place, 12 cities had experienced a combination of sprawl and decline, these mainly located in Eastern Europe though the list also includes 2 English cities and 2 Italian ones. Six of the 45 cities registered growth with containment and are to be found in Denmark, Sweden, Greece and Cyprus, while just 2 were classified as “decline with containment”: Campobasso in Italy and Kalamata in Greece.

Drawing on in-depth case studies of 7 of the 45 cities as well as a review of the wider literature, Leontidou and Couch (2007) conclude that there exists a triplet of broad regional contrasts in the nature of sprawl in Europe. In their own words (p. 256, emphasis as in the original):

1. Cultures of urbanism in **Southern** Europe have created compact cities in combination with *infrastructure-related* urban sprawl after long periods of popular suburbanization as a means of survival.
2. Anti-urbanism in **Northern** Europe created *lifestyle-related* urban sprawl, by the elites and middle classes wishing to escape urban squalor by moving to the countryside.
3. *State-induced* sprawl in **Eastern** Europe has *deconstructed* the compact city/pastoral landscape antithesis through the development of post-suburban landscapes which are usually not residential after the transition in the 1990s.

They acknowledge, however, that most European cities fall between these archetypes. Moreover, the fundamental North/South cultural dichotomy has been altering since the post-socialist transition and also through the move towards urban competition and the entrepreneurial city that has led to the coincidence of re-urbanization and urban sprawl. The “Mediterraneanization” of the North is seen as one of the most important changes in European urban culture of recent decades, raising the possibility of urban convergence (Leontidou and Couch, 2007, p. 263).

With the general prevalence of sprawl across European cities indicated by the full sample of 45 cities, it is not surprising that the EU has been giving much attention to this issue in recent years. As with Couch and others (2007), a small number of city case studies provided the core of its SCATTER project

on “Sprawling Cities and Transport: From Evaluation to Recommendations” (see Gayda and others, 2005). Examining data up to 20 years of change in the internal distribution of population and employment for all these cities plus income, housing and commuting for some of them, the SCATTER project concluded that the cities could be clustered into three groups with distinctive deconcentration patterns. Milan and Bristol were found to be characterised by continuing and rather strong spatial deconcentration, with the former seeing centrifugal movement over increasing distances and with redistribution in the Bristol urban region having a more polycentric pattern. For Brussels and Stuttgart, the deconcentration had been more moderate and appeared to have disappeared, apart from the latter still having a low level of outward shift of population by the end of the study period but no longer one of jobs. For Helsinki and Rennes, by contrast, the dominant pattern was one of spatial concentration of activities, though there was also evidence of some scatteration, this being produced partly by these cities’ in-migrants settling not only in their urban centres but also in their outer urban rings.

The EU project on “Spatial Deconcentration of Economic Land Use and Quality of Life in European Metropolitan Areas” (SELMA, 2004) also used the case study approach, selecting a pair of larger and smaller cities from each of seven countries (six in Europe plus Israel). The emphasis here was primarily on the changing distribution of jobs within the 14 city regions. Employment change in the two Dutch cases was found to be led by producer services exiting historic cores to form suburban concentrations along major motorways. The data from Britain also reveals faster outer growth, but more for population than for jobs. In Denmark employment deconcentration has been taking a more dispersed pattern rather than focusing on the suburban nodes served by rail, though a back-to-the-city can also be observed in the case of Copenhagen. In Spain and Italy metropolitan areas have so far retained a strong monocentric pattern of employment, but central city population has stagnated or begun to decline in the Italian cases. Finally, in the Czech Republic, profound changes have occurred since 1990, with early investments being directed at the commercialization of city centres but being followed soon afterwards by suburbanization pressures. Here, unusually, the employment shifts have preceded the residential ones, with the movement of middle-class families into low-density neighbourhoods starting only recently.

The ESPON programme includes a review of urban sprawl in the context of a wider examination of urban-rural relations (Bengs and Schmidt-Thomé, 2006). This study observed that the often, rather fine balance between centripetal and centrifugal forces leads to different types of sprawl and identified four profiles (Bengs and Schmidt-Thomé, 2006, p. 231). First, when observed at the regional scale, urban sprawl is characterised by the emergence of secondary urban centres. A second type involves infill, as scattered and low-density housing development locate between urban centres or transport corridors. The third type is sprawl that is generated by the part of the population that has no other choice but to relocate because of the increasing costs of life in urban centres. Finally, sprawl can manifest itself in the erection of service and business centres outside the compact city boundaries, which will then tend to attract housing development, setting the ground for further dispersal. Bengs and Schmidt-Thomé (2006) go on to look at policy responses under the heading “urban containment,” focusing on interventions in the development and property markets of France, Germany, Italy and the United Kingdom.

D. IMPLICATIONS FOR STUDYING URBAN AND RURAL AREAS

It is primarily the lateral extension of urban nodes, commonly referred to as “sprawl” as noted above, that raises issues for the definition and measurement of urbanization in Europe, though the challenge is magnified by the way in which adjacent settlements tend to merge into each other in more heavily populated areas and also by the general increase in individual personal mobility that facilitates these tendencies. The latter also means that, even where individual urban areas remain physically discrete from one another (as, for instance, has largely been achieved in the United Kingdom since 1947 through strict controls on the location of new building), they can still be rather intimately linked to each other by regular—even daily—flows of people, goods and services. Trends in urban development patterns have

therefore not just made the task of defining urban and rural areas more difficult, but at the same time they have challenged the underlying rationale for doing this.

In their ESPON 1.1.2 project report, Bengs and Schmidt-Thomé (2006) raise these issues in no uncertain terms: “Currently, it is not so easy to argue in favour of the traditional split between the two spheres of urban and rural Europe. ... A clear-cut visual divide has simply gone, being replaced by *rurbanization*, a process where the physical environment loses qualities that were traditionally associated with urban or rural settings. In most countries, urban centres have long since lost their particular privileges and there is no longer a clear difference in administrative status between town and countryside, or it is blurred (...) What is left? Is the urban-rural divide totally anachronistic?” (p. 12, emphasis as in original)

This led them to the central question that their study was designed to address, namely: “Is it possible and sensible to make a distinction between urban and rural areas in Europe?” (Bengs and Schmidt-Thomé, 2006, p. 12). It is also the question that was tackled at the global scale by the International Union for the Scientific Study of Population (IUSSP) Working Group on Urbanization (Champion and Hugo, 2004) and indeed has been the subject of much discussion over the 60 years since the United Nations made its initial recommendations on measuring urbanization and even before that (see Champion, 2004, and Zlotnik, 2004, for further details).

The conclusion reached by the ESPON 1.1.2 report on urban-rural relations in Europe is that something along these lines is still worthwhile, but that the topic is best examined in terms of larger regional zones Nomenclature of Territorial Units for Statistics 3 (NUTS3) rather than urban agglomerations. At the same time, it is suggested (Bengs and Schmidt-Thomé, 2006, p. 19) that this approach is flexible enough to be applied at a variety of scales that could include ones as fine-grained as NUTS5 (which equates to the electoral ward in the United Kingdom and can be thought of as residential quarters in large cities, though combining several settlements in a sparsely populated area).

The ESPON 1.1.2 urban/rural classification is based on two main dimensions that are then operationalised using a number of indicators. One dimension is the “degree of urban influence,” for which two factors were taken into account: population density (whether the NUTS3 region had a population density above or below the European average of 107 persons per square km) and status of the leading urban centre of the region (whether or not this centre had been labelled a “Metropolitan European Growth Area” or MEGA, as defined by the ESPON 1.1.1 project). If a region satisfied either or both of these criteria, then it was classified as being of high urban influence, otherwise as of low urban influence. The other dimension, “degree of human intervention,” was determined by the relative shares of three types of land cover (artificial surfaces, agricultural areas and residual land) as given by the Coordination of Information on the Environment (CORINE) data set. Using a set of rules based on whether the shares of these were above or below the European average, regions were classified three ways into high, medium and low human intervention types, which when cross-tabulated against the twofold urban-influence dimension produced a six-way classification of NUTS3 units across the 29 European countries covered by the study (the then current EU25, the two more recent accession states of Bulgaria and Romania, and Norway and Switzerland). By way of example, table 3 presents some headline results from this work, based on data for 28 of the 29 countries (comparable data was not fully available for Norway).

TABLE 3. SELECTED INDICATORS FOR A SIX-WAY URBAN/RURAL TYPOLOGY OF EUROPE

<i>Type code</i>	<i>Regional classification</i>		<i>Number of NUTS3 regions</i>	<i>Population density 1999 (persons per square km)</i>	<i>Population change 1995-1999</i>		
	<i>Degree of urban influence</i>	<i>Degree of human intervention</i>			<i>EU25+3</i>	<i>EU15+1</i>	<i>EU10+2</i>
1	High	High	691	330	0.84	1.10	-0.78
2	High	Medium	52	127	1.06	1.54	0.30
3	High	Low	34	139	1.01	1.02	0.39
4	Low	High	131	81	-0.18	2.21	-1.15
5	Low	Medium	184	55	0.64	0.78	0.24
6	Low	Low	201	29	0.08	0.28	-0.88
All 6 types			1 293	114	0.68	1.04	-0.64

Source: Bengs and Schmidt-Thomé, 2006, table 3.6. See text for countries covered.

Bengs and Schmidt-Thomé (2006) then discuss what this population change data reveal for trends towards concentration and deconcentration for the whole of Europe and for the former socialist countries (EU10+2) compared with the rest. In general, the regions of high urban influence are characterised by stronger growth than those of low influence, whether or not standardizing for degree of human intervention. Within each of the two urban influence classes, however, there is somewhat more variation as to which of the three human intervention classes is the strongest growing. The “high” class has the highest growth rate for the low urban influence regions (i.e. type 4) of the EU15+1, whereas it is the “low class” that is in this position for the high urban influence regions of the EU10+2. Otherwise, however, it is the medium human influence regions that score highest, as is also the case for the Europe-wide patterns for both high and low urban influence regions. The report therefore concludes that in the EU15+1 there seems to have been a slight decentralization in the three regional types with high urban influence, but centralization for the three regional types of low urban influence. The results for the EU10+2 are interpreted as evidence of “a kind of suburbanization” (Bengs and Schmidt-Thomé, 2006, p. 173).

This ESPON 1.1.2 classification represents a rather common approach to classifying territory at scales higher than individual parcels of land. In section B above, we saw the example of England’s DEFRA urban/rural district typology that first identifies the areas covered by the larger cities and then allocates the remaining districts to categories by reference to the proportion of people living in rural places. A parallel approach to settlement classification in England, adopted by DEFRA’s urban equivalent (now called Department of Communities and Local Government, DCLG) for its State of the Cities 2005 Report (Parkinson and others, 2006), gives greater emphasis to city size, grouping 56 cities into four categories (London, Mets, Large Cities, Small Cities) as well as recognising two further categories (Large Towns, Small Towns and Rural).

Clearly, settlement size is still regarded as an important basis for differentiating territory, but this is primarily for the upper end of the urban hierarchy. By contrast, a wider range of criteria are now commonly being used for smaller settlements and more rural regions. The justification for this is well articulated by Coombes (2004), whose examination of recent trends in a number of countries suggested three main dimensions of settlement systems: the size of settlements, the intensity or concentration of settlements, and accessibility to services and other facilities. These three, it is claimed, are not substitutable for one another and, indeed, it is likely that their degree of non-conformity will be greater in regions that do not contain larger cities. Some settlements will score higher (can this still be termed “more urban?”) on one of these criterion than another. Hence the value of a classification like that of ESPON 1.1.2 that involves more than one dimension.

Finally, there is also the issue of what territorial units are used as the building blocks for these territorial classifications. Many classifications are hampered by the use of rather large statistical recording units that are primarily determined by administrative structures. The ESPON 1.1.2 urban/rural typology described above is based on (NUTS3) regions which do not provide a very good fit to the geography of the urban system. Meanwhile, both the DEFRA and DCLG classifications for England are primarily based on cities defined as physical “agglomerations” and ignore the fact that these constitute only part of the whole city because green-belt and other planning interventions have imposed a zone that further development of that city has had to leap-frog. In some other countries, it would seem to be physical urban sprawl that provides the main challenge for identifying what constitutes the entirety of a city. Hence the increasing popularity of the “metropolitan region” concept (see, for instance, OECD, 2006), where this is defined not in the United Nations’ sense of physical agglomeration or the related concept of “conurbation” but instead is defined in terms of the city’s functional region and measured through daily or quite regular spatial interaction like commuting.

In conclusion, in the task of classifying territory for the purposes of studying urbanization and population redistribution across settlement systems, perhaps the most appropriate way forward is a two-level approach that captures both the type of settlement that people live in and also the broader regional context. This is by no means a new suggestion. Indeed, it was advocated by John Grauman of the United Nations almost 40 years ago (United Nations, 1969, p. 3): “A fourfold classification, separating ‘urban’ and ‘rural’ areas both within and outside the larger regions of urban dominance, might provide a more relevant framework of analysis” than what was currently being used. This idea was then endorsed by the United Nations (1973, p. 12), as follows: “Looking in to the future (...) one can incline to the view that a fourfold classification may eventually serve most practical purposes the best. It may become necessary to distinguish urbanized and non-urbanized areas (...) both within the metropolitan regions and outside such regions, resulting in four categories such as metropolitan urbanized, metropolitan rural, non-metropolitan urbanized, and non-metropolitan rural populations.” That anticipated future would seem to have arrived, judging by the wealth of evidence now assembled on new forms of urbanization (including Champion and Hugo, 2004, and National Research Council, 2003). Moreover, four decades on, there is the possibility of much greater sophistication in developing indicators for application at both the local and regional levels of such a classification.

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Part Four
Population distribution, urbanization and climate
change

THE IMPACT OF CLIMATE CHANGE ON THE SPATIAL DISTRIBUTION OF POPULATIONS AND MIGRATION

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A. INTRODUCTION

There is a growing consensus that even if the global community makes serious and immediate efforts to curtail greenhouse gas emissions, climate change will have far-reaching impacts on the environment, natural resources and the human populations that depend on them from this century onwards.

The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC), released in 2007, states that there is mounting scientific evidence of ongoing climatic changes; near certainty that there will be future changes owing to current and future greenhouse gas emissions; near certainty that future climatic changes will engender a cascade of major environmental impacts; and based on all of above, heightened policy attention and concern over adaptation processes and how to mitigate climate change and on how to adapt to future impacts. The report of IPCC's Working Group II, on Impacts, Adaptation, and Vulnerability (reviewed in greater detail in part B), emphasizes that the world is on the brink of potentially severe climatic changes that will have far reaching implications for the human populations and their geographic distributions.

The IPCC AR4, the most weighty assessment of climate science to date, is nevertheless just one of many reports issued within the last two years that warns of significant climate change impacts. The potential economic costs of climate change are assessed in the Government of the United Kingdom's *Stern Review* (Stern, 2006), which states that "Climate change will affect the basic elements of life for people around the world—access to water, food production, health, and the environment. Hundreds of millions of people could suffer hunger, water shortages and coastal flooding as the world warms." Political scientists and security specialists have weighed in with two recent reports, one by the German Advisory Council on Global Environmental Change (WBGU) entitled *Climate Change as Security Risk* (WBGU, 2007), and the other by the Center for Strategic and International Studies and the Center for New American Security entitled *The Age of Consequences* (Campbell and others, 2007). Both take a sober view of the potential for political unrest and violence resulting from climatic changes, with the WBGU stating that "without resolute counteraction, climate change will overstretch many societies' adaptive capacities within the coming decades... [resulting] in destabilization and violence, jeopardizing national and international security to a new degree." The economic development community has also weighed in: the focus of UNDP's *Human Development Report 2007/2008* is "Fighting climate change: Human solidarity in a divided world." The report starkly states, "In today's world, it is the poor who are bearing the brunt of climate change. Tomorrow it will be humanity as a whole that faces the risks that come with global warming."

The focus of this paper is on climate change and its impact on the spatial distribution of populations, especially vulnerable populations, and on migration. Its goal is to review the best scientific research on climate change impacts, vulnerability and environmental migration in an effort to ascertain the likelihood and scale of major population displacements resulting from climate change. To accomplish this, the spatial aspects of interaction between climate change and demographic variables was assessed.

The paper includes a review of current patterns of population distribution and the location of the most vulnerable populations to climate change as well as the expected impacts of climate change on migration dynamics, both internal and international.

It is important to state from the outset that there is a great number of uncertainties inherent in climate science, some of which are due to lack of sufficient understanding and some to inherent complexities and potential non-linearities in the Earth system's response to climate change from greenhouse gas emissions. On the other hand, social scientists are well aware of the uncertainties in attempting to model human behavior. When coupled with complex environmental and human systems, the uncertainty levels increase and the potential for unanticipated outcomes increases. Hence, the best that can be done is to attempt to report what the research shows to date and also to underscore that projected impacts of climate change on future population distribution and migration is by its very nature highly contingent upon a complex array of factors that may not at present be fully known or easily anticipated.

B. THE ANTICIPATED IMPACTS OF CLIMATE CHANGE AND THEIR GEOGRAPHIC DISTRIBUTION

Before assessing the spatial distribution of populations—and especially vulnerable populations—at risk from climate change impacts, what those impacts are likely to be and their geographic distribution will first be assessed. In other words, the nature of the hazard will have to be established. This chapter provides a brief summary of all anticipated impacts and their likelihood contained in the Working Group 2 report of the IPCC AR4. It also explores the anticipated geographic distribution of these impacts. While it is difficult to fully and accurately assess the regions and populations most at risk, there is some certainty regarding the vulnerability of certain areas such as low-lying small island states.

1. *The IPCC fourth assessment report on impacts*

The Intergovernmental Panel on Climate Change (IPCC) released its Working Group II (WG II) Fourth Assessment Report (AR4) on Impacts, Adaptation and Vulnerability on April 6, 2007. The report predicts elevated risks of droughts, floods, sea-level rise and heat waves. The increased risks typically result from a cascade of effects that, in turn, unleash another cascade of impacts. For example, in Asia and parts of Latin America, the retreat of alpine glaciers is expected to enlarge glacial lakes, threatening downstream communities with natural dam bursts and causing water shortages for agriculture, industry, and human settlements. Rising sea levels may be accompanied by more intense tropical cyclones, resulting in heightened storm surges dangerous to coastal communities. Existing hazards—such as forest fires and air pollution in cities—may become more widespread, frequent and intense due to higher average temperatures and heat waves.

In today's densely settled world with production and consumption systems that are increasingly interconnected, perturbations to these systems will most certainly pose risks. Climate, however, is so crucial that any changes to it are likely to simultaneously impact all other systems—from ecosystems to agricultural, water supply, energy and transportation—and the human communities that depend upon them (Dyson, 2005; de Sherbinin and others, 2007c). These communities will either need to adapt to climatic changes *in situ* or relocate to areas where the climate is more favourable.

Although WG II strives to provide a balanced picture—listing both the benefits and costs of climate change—the summary report nevertheless tends, on balance, to underscore the potential negative effects of climate change. Working from the IPCC WG I climate change predictions, the following

projections and associated impacts are presented in the order of their relative likelihood of occurring, defined in probabilistic terms¹:

Warmer and more frequent hot days and nights over most land areas (likelihood: virtually certain):

- Decreased agricultural yields in warmer environments and increased likelihood of pest outbreaks
- Higher evapotranspiration leading to increased risk of droughts
- Declining air quality in cities
- Wildfire danger

Increases in warm spell/heat wave frequency over most land areas (very likely):

- Wild fire danger
- Water quality problems and algal blooms
- Risk of heat-related mortality, especially for elderly, infirm and very young populations

Increases in heavy precipitation events over most areas (very likely):

- Agricultural soil erosion
- Contamination of water supplies
- Mortality risk from flooding
- Disruption of settlements, commerce and transport owing to flooding and landslides

Increases in areas affected by drought (likely):

- Crop damage and failure, lower yields, livestock deaths and wildfires
- Water stress
- Food and water shortages, risk of malnutrition, risk of water and food-borne diseases
- Water shortages for settlements and industry, reduced hydropower generation, increased population migrations

Increasingly intense tropical cyclone activity (likely):

- Damage to crops
- Risk of deaths and injuries from wind and floods
- Power outages that affect water supplies, withdrawal of risk coverage by insurers

Rising sea level (likely):

- Salinization of irrigation water
- Saltwater intrusion of aquifers and coastal water sources
- Risk of death from drowning
- Movements of populations and infrastructure, high costs of relocation or armaments

Predicted impacts vary substantially by geographic location. Lower latitudes are expected to experience declines in agricultural yields. Low-lying coastal areas are vulnerable to sea-level rise and storm surges. The great agricultural basins of the Indus and Yangtze Rivers are threatened by reduced summer flows from dwindling glaciers and winter snow pack, which will reduce water availability for Pakistani agriculture (where 90 per cent of crops are irrigated) and China's growing industries.

¹ The IPCC uses precisely defined language to describe likelihoods. Virtually certain > 99 per cent probability of occurrence, very likely = 90-99 per cent, likely = 66-89 per cent, about as likely as not = 33-66 per cent, unlikely = 10-33 per cent, very unlikely = 1-10 per cent, and exceptionally unlikely = < 1 per cent probability.

The remainder of this sub-section describes those climate change impacts that are likely to have the greatest effect on population distribution: changes to freshwater resources and productive systems, on the one hand, and sea-level rise and flooding in low-lying areas, on the other.

a. Freshwater resources and productive systems

Reductions in food production are likely to have the greatest impact on the poor (Sperling, 2003; Dyson, 2005; WBGU, 2007).² According to Dyson:

Probably the most important consequence of future climate change for human populations relates to agricultural production in the world's tropical and semi-tropical regions. Food production in such regions is an activity that is unlikely to be able to adapt to a rapid rise in temperature, and it will almost certainly not be able to cope with any abrupt change in climate. Perhaps no economic generalization is sounder than that small decline in food production can produce big rises in food prices—often with very significant sociopolitical ramifications. (Dyson, 2005, p.145)

The AR4 finding that there will be warmer and more frequent hot days and nights indicates that there will be concomitant increases in potential evapotranspiration (PET). Even if precipitation were to remain unchanged, PET will increase as a function of temperature. From a population distribution perspective, the primary issues here are declines in agricultural yields and droughts, which primarily affect agro-pastoral activities, but can also affect hydropower generation and industrial and domestic water use if severe enough. The list of projected impacts in agricultural and food systems include crop damage and failure, lower yields, livestock deaths and wildfires, leading to food shortages and risk of malnutrition. Water scarcity from prolonged drought could also affect future population distributions independent of the impacts on the agricultural sector, notably if water supply systems cannot keep pace with changes in climate for either technical or political reasons. In scenarios of increasing scarcity, it may be technically feasible but politically unpalatable to pursue water transfer schemes from water abundant to water scarce regions.

At lower latitudes, even 1-2°C increases are likely to have negative impacts on the yields of major cereals, increasing the risk of hunger (Parry and others, 2007, p. 38). Studies indicate that the increasing frequency of heat stress and drought, as well as floods, creates further shocks for the agricultural systems in low latitude regions and that these shocks go beyond the impacts of mean temperature increases (Parry and others, 2007, p. 38). Even delays in the onset of the rainy season, or changes in the pattern of rainfall during the growing season, can have major impacts on small holder agriculturalists—and such changes have been documented in many regions such as the Sahel. Shocks owing to climate variability and extreme weather events can reduce household resources and coping capacities, sending families deeper into poverty.

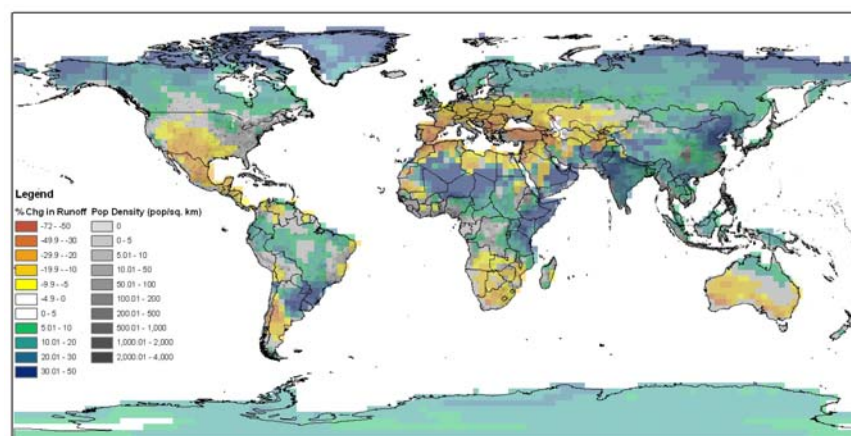
Much of the developed world's population resides in urban areas and would not be directly affected by changes in agricultural systems, apart from a likely increase in food prices. Furthermore,

² Although the vulnerability of food production systems in low income countries is emphasized, it is worth noting that small holder farmers and pastoralists, especially in the dry lands, have been adapting to climatic fluctuations for centuries (Batterbury & Forsyth 1999; Adejuwon 2005; Leary and others, 2006). While subsistence farmers have the adaptive capacity the climatic changes foreseen in the 21st century are unprecedented and are occurring at a time of higher population densities and greater economic interdependencies brought about by globalization, such that relying on past experience may lead to erroneous conclusions.

agricultural systems in the mid- to high-latitudes are expected to benefit from initial moderate warming and carbon dioxide fertilization effects (Parry and others, 2007, p. 38).³ So, although developed country agricultural systems and food supply chains may be impacted by periodic drought, the populations fed by their modern industrialized agricultural systems are far enough removed that they will be unlikely to have to relocate as a result of changes in those systems. However, the situation is quite different for the developing world. Much of South and Southeast Asia and sub-Saharan Africa are still rural and dependent on natural resources for their survival. These are the populations most vulnerable to changes in precipitation, PET and overall freshwater resources.

Figure 1 shows the percentage changes in runoff⁴ between the year 2000 and 2080 based on weighted ensemble model runs generated from the Special Report on Emissions A1B scenario⁵ (Nohara and others, 2006; Parry and others, 2007), and overlaid on a global population distribution surface (CIESIN and CIAT, 2005). This illustrates areas in which runoff, a proxy for water availability, is likely to increase or decrease significantly based purely on climate parameters. The regions with the largest percentage decline in runoff are Central America and southwestern United States of America, the southern cone of South America, South Africa, the entire Mediterranean basin, Central Asia and the southern half of Australia.

Figure 1. Percentage change in runoff overlaid on population distribution by region



Source: Based on Nohara and others (2006) and CIESIN (2005)

Although runoff may *increase* by up to 50 per cent in East Africa and South Asia, populations are expected to increase by 121 per cent in East Africa and 50 per cent in India and Nepal by 2050 (PRB, 2007), leaving these regions with either lower or unchanged per capita water availability. Furthermore, increased variability and extreme precipitation events (e.g., tropical cyclones) may result in a greater frequency of droughts and floods, rapid runoff and soil erosion, all of which could result in yield declines despite increases in annual precipitation. There will also be changes in the seasonal distribution of

³ Longer term impacts on developed country agricultural systems under “business as usual” emissions scenarios are likely to be more consistently negative, however.

⁴ Runoff is the proportion of precipitation that is left after evapotranspiration and after the soil moisture deficit is satisfied. It is typically reported in millimeters, just like precipitation.

⁵ The A1 family of scenarios is characterized by rapid economic growth, population stabilization at 9 billion by 2050 followed by declines, a rapid spread of new and efficient technologies, and regional convergence in terms of income and way of life, and scenario A1B represents a balanced usage of all energy sources.

rainfall, which can impact cropping systems as well as a likely increase in extreme events bringing large amounts of rainfall in short periods of time. This can overwhelm the capacity of water retention, storage, and canalization infrastructure, leading to widespread flooding, erosion and crop loss. Hence, increasing runoff is not in itself necessarily a positive development, except perhaps for the most water-scarce regions.

According to the IPCC, “Agricultural losses are shown to be possibly severe for several areas (e.g., the Sahel, East Africa and southern Africa) accompanied by changes in length of growing periods impacting mixed rain-fed, arid and semi-arid systems under certain climate projections. In some countries, yields from rain-fed agriculture could be reduced by up to 50 per cent by 2020” (Parry and others, 2007, p. 48). A study by Brown and Lal (2007) found that the water holding capacity of many African countries (e.g. through dams and reservoirs), an important measure of resilience to drought, is inadequate in most countries and that countries with the worst institutions score, on average, much worse on a water storage capacity index.

Populous and densely settled countries such as India and China will also suffer. According to the AR4: “The per capita availability of freshwater in India is expected to drop from around 1,900 m³ at present to 1,000m³ by 2025 in response to the combined effects of population growth and climate change. More intense rain and more frequent flash floods during the monsoon would result in a higher proportion of runoff and a reduction in the proportion reaching the groundwater” (Parry and others, 2007, p. 59).

Groundwater tables in India have already been dropping for more than a decade due to the unregulated tapping of aquifers (Foster and Chilton, 2003). In China, officials are working on massive water transfer schemes from the humid south to the water scarce but more populous northern regions. Interseasonal, interannual and spatial variability in rainfall trend has been observed during the past few decades all across Asia, including China, and a drying trend has been detected in northern China (Cruz and others, 2007). The impact of reduced snow pack and glacier loss (resulting in summer low-flows), and the potential of higher rainfall variability, creates the dual problem of crop losses and water scarcity for growing industries.

Water scarcity impacts (affecting domestic, industry and hydro power) will affect developed and developing regions more evenly. A long-term drying is potentially underway in the American South West, reducing water availability for irrigated agriculture and the rapidly expanding settlements in Arizona and Nevada. The Mediterranean basin and particularly Spain, is likely to be impacted by drying as well. These changes will strain the adaptive capacities of even the wealthiest regions and could lead to some redistribution of population.

Hydrological modeling typically takes place at the scale of major river basins rather than nation-states. Although progress has been made, quantitative projections of changes in precipitation and river flows at the river-basin scale remain uncertain. Despite this, the AR4 reports with high confidence that the number of people living in severely stressed river basins is projected to increase from around 1.5 billion in 2005 to between 4.3 and 6 billion in 2050 under the A2 “business as usual” emissions scenario (p.44).⁶ Areas in which runoff is projected to decline will face a decline in the value of services provided by water resources and those regions in which runoff is projected to increase face the potentially negative off-setting impacts of seasonal runoff shifts that impact water supply, water quality and flood risks.

⁶ The Special Report on Emissions Scenarios (SRES) A2 scenario presents a “differentiated world” in which the world consolidates into a number of economically differentiated regions that are more socially and technologically isolated than in other scenarios and in which income gaps remain high.

Glacier melt is a regional issue of particular severity for those populations living in river basins fed by flows emanating from the Himalayan and Andean mountain ranges. According to the AR4, “More than one-sixth of the world’s population live in glacier- or snowmelt-fed river basins and will be affected by a decrease in the water volume stored in glaciers and snowpack, an increase in the ratio of winter to annual flows and possibly a reduction of low flows caused by decreased glacier extent and melt-season snow water storage” (Parry and others, 2007, p.35). Large portions of the populations of Pakistan, India, Bangladesh and China will be impacted.

Offsetting some of these negative trends, it is anticipated that carbon dioxide enrichment up to 550 parts per million (ppm) will have a modest positive “fertilization effect,” increasing global average yields to the order of 10 to 20 per cent for C3 crops (constituting 95 per cent of plant species) and 0 to 10 per cent for C4 crops.

b. Coastal systems and low lying areas

Sea-level rise and coastal flooding is likely to be the second most damaging aspect of climate change on vulnerable populations, affecting most dramatically urban-based populations and especially the urban poor. This section focuses on flooding from both extreme precipitation events and sea-level rise. Estimates by the World Bank (2005) indicate that flooding will cause heavy economic losses and that it may affect a larger land area (14.4 million km²) and a greater number of people globally (3.9 billion people) than all other major environmental hazards—cyclones, droughts, earthquakes, volcanoes and landslides—combined.

Coastal areas and particularly low lying coasts and deltas, are most vulnerable to flood hazards. According to the AR4, coasts are highly vulnerable to extreme events such as storms, which impose substantial costs on coastal societies. Annually, about 120 million people are exposed to tropical cyclone hazards. These killed 250,000 people between 1980 and 2000. Throughout the 20th century, the global rise of sea level contributed to increased coastal inundation, erosion and ecosystem losses, but the precise role of sea-level rise is difficult to determine due to considerable regional and local variation, which in turn is due to other factors (Parry and others, 2007, p. 40).

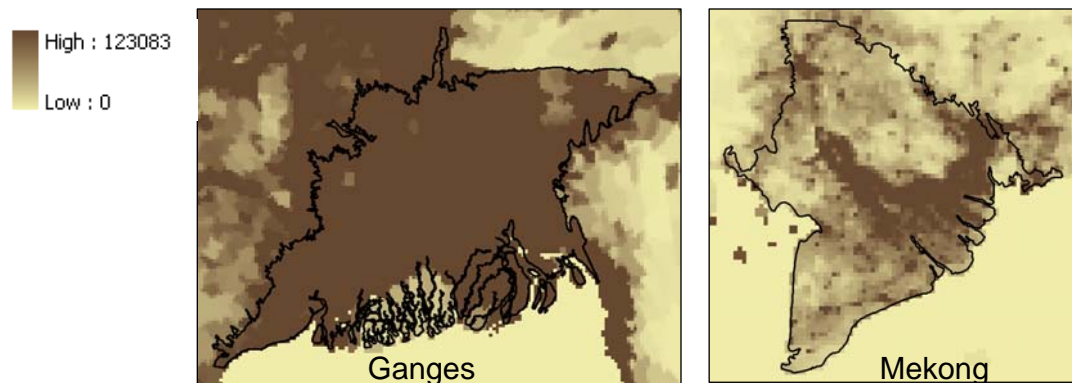
Although mortality risks from cyclones will increase, they will be unlikely to displace populations permanently. By contrast, projected sea-level rise of 0.2-0.6 meters by 2100 will result in permanent relocations as coastal areas—particularly areas of high coastal subsidence—are either submerged or subjected, with increasing frequency, to storm surges as cyclones intensify (an issue taken up again at the end of part D).

While the impact of temperature increases on crop yields will vary, the impacts on coastal areas are expected to be overwhelmingly negative and will be more evenly distributed among high and low income countries, though high income countries are more likely to have the resources to erect flood defenses and carry out other adaptation measures. The IPCC predicts increased flooding and the degradation of freshwater (through flood runoff and salt-water intrusion) and fisheries could impact hundreds of millions of people and the socioeconomic costs for coasts are virtually certain to escalate (Parry and others, 2007, p. 40).

In terms of their productive capacity, coastal zones have long sustained large fishing communities. Acidification of oceans (from carbon dioxide absorption), the loss of coastal wetlands and mangroves and coral bleaching (a result of rising sea surface temperatures), will have significant negative impacts on coastal societies dependent on ecosystem goods and services such as natural fisheries.

According to the AR4, three key hotspots of societal vulnerability are: (i) deltas, especially the seven Asian mega-deltas with a collective population already exceeding 200 million; (ii) low-lying coastal urban areas, especially those prone to subsidence; and (iii) small islands, especially coral atolls (Parry and others, 2007, p. 40). Sea-level rise impacts will be greatest in areas of coastal subsidence, which occurs naturally but is exacerbated by reduced sediment replenishment from the construction of upstream dams and progressive sediment compaction (Syvitski, 2008). Deltas are often located in areas of such subsidence. Among the seven Asian mega-deltas mentioned by the IPCC are the Ganges-Brahmaputra delta in Bangladesh and India, with a population of 147.4 million and the Mekong, with a population of 28.2 million in the year 2000 (de Sherbinin, 2007) (figure 2). Assuming current population distributions are maintained, by the year 2015, the populations in these two deltas are projected to increase to 189m and 35m, respectively. Salt-water intrusion is already an issue affecting tube wells in the Ganges-Brahmaputra delta and this will only intensify with rising sea-level (Rashid and Kabir, 1998). Given that 77 per cent of Bangladesh's population is rural and dependent on highly productive flood plain agriculture, the possibility of large-scale permanent displacements from the delta cannot be discounted.

Figure 2. Population Density in Two Deltas
(Population per 2.5 minute grid cell (21.6 sq.km. at the equator))



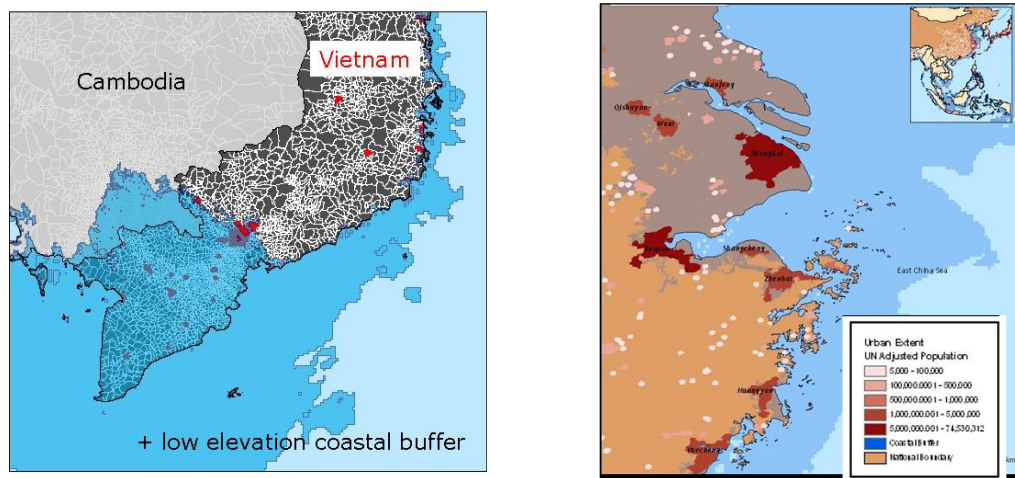
Source: de Sherbinin (2007)

A study by McGranahan and others (2007) examined impacts on populations in low elevation coastal zones (LECZ) defined as less than 10 meters above sea-level. They found that this coastal strip included less than 2 per cent of global land area, yet it contained 10 per cent of the global population and 13 per cent of the world's urban population. Sea level rise of this magnitude would cover the entire Viet Nam portion of the Mekong delta, inundating up to half of Ho Chi Minh City and completely submerge Shanghai in the Yangtze Delta (figure 3). Although a rise of 10 meters would not materialize for perhaps two or three centuries, scientists have underscored uncertainties owing to the lubricating effect of melt water on glacier flows, with some suggesting sea-level rise of up to one meter by the end of this century (Real Climate, 2007)—contrasting with the IPCC more conservative estimate of 0.2-0.6 meters. According to the AR4, “A 1meter rise in sea level would lead to a loss of almost half of the mangrove area in the Mekong River delta (2,500 km²), while approximately 100,000 ha of cultivated land and aquaculture area would become salt marsh” (Perry and others, 2007, p. 59). Dasgupta and others (2007) pointed out that even relatively small rises in mean sea level can have major impacts because they amplify the effect of storm surges and erode natural defenses such as mangroves and sea grasses.

Concerns regarding sea-level rise impacts on small island states have already been widely reported. Although up to 100 per cent of the land area of some islands (e.g., Tuvalu) will be inundated by a 5m rise in sea-level, it must be acknowledged that from the global population distribution perspective,

the populations affected will be small. From a cultural, humanitarian and sovereignty perspective, however, the stakes for these countries are immense.

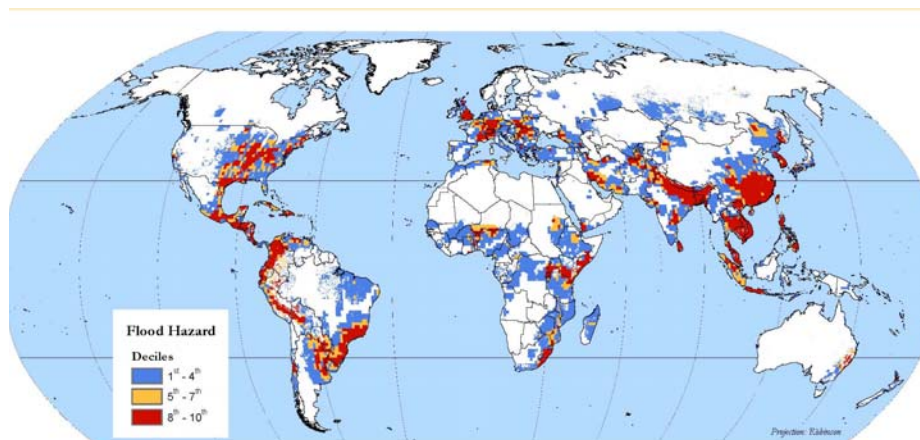
Figure 3. Impacts of a 10m Sea Level Rise on the Mekong (A) and Yangtze (B) Deltas



Source: Balk and others (2006)

Regions *currently* at greatest risk of flooding are eastern China, the Mekong basin, the Ganges basin in India, the great lakes region of Africa, northern Nigeria and eastern South Africa, France and Germany, the Danube basin, eastern South America from Rio De Janeiro to the Plata estuary, the Andes north from Peru to Colombia, all of Central America and the Mississippi basin in the United States (see red areas of figure 4). Barring adaptations such as tree planting, dams and dykes, flood risk will increase in these regions.

Figure 4. Flood Hazard Distribution



The data set comes from the Dartmouth Flood Observatory's global listing of extreme flood events compiled from various sources for the 19-year period from 1985 – 2003. Some flooding is evident in more than one-third of the world's land area.

Source: World Bank (2005)

C. VULNERABILITY TO CLIMATE CHANGE AND POPULATION DISTRIBUTION

The risk of being affected by environmental hazards is related to how vulnerable individuals and population groups are (Blaikie and others, 1994, p. 21; see also Bohle and others, 1994). In the context of climate change, Working Group II of the IPCC defines vulnerability as “the degree to which a system is susceptible to and unable to cope with *adverse effects* of climate change⁷, including climate variability and extremes. It is a function of the character, magnitude and rate of climate change and the variation to which a system is exposed, its sensibility and its adaptive capacity” (Parry and others, 2007, p. 27).

Vulnerability and poverty are not synonymous although they are empirically and conceptually related. Moser (1998) argues that poverty is a static concept, while vulnerability is more dynamic and a better concept for measuring change. Chambers (1995) maintains that poverty refers to lack of physical requirements, assets and income; while vulnerability focuses on the exposure to shocks, stress and risks, and on the deficiency of means to face the damage or loss. But both terms are dimensions of a broader concept, deprivation. The AR4 states that “the poor and marginalized have historically been most at risk and are more vulnerable to the impacts of climate change” (Adger and others, 2007, p. 720).

How vulnerable individuals are depends on a number of factors, from individual demographic characteristics to macro-level indicators such as level of development and economic and social contexts. Two analytical dimensions are relevant:

- (a) The external dimension, defined by the exposure to hazards or risk just for being present at the place and time of occurrence of the particular hazard. This implies that vulnerability varies across space and over time. Natural environments as well as the availability of housing, infrastructure and economic opportunities, is not uniform and influence risk (Uitto, 1998; Kasperson and others, 1995; Blaikie and others, 1994; Schneider and others, 2007). As a consequence, the impacts of climate change—at the global, regional and local levels—are not evenly distributed but embedded in contexts and history (e.g., prior stresses, level of development, or political institutions) (Adger and others, 2007, p. 720; Elasha and others, 2006; Alam and others, 2007; Matta and Nobre 2006). For example, urban or rural residence affects access to basic services and resources and filters the influence of the broader economic and political contexts. In general, rural populations are more isolated and depend critically on the maintenance of transportation networks. They tend to show higher social cohesion than urban areas—which could be a key issue in case of impacts (see for example Klinenberg, 1999)—and their social networks are tight, but they also can be sparse. Natural resource dependent livelihoods such as farming, ranching or pastoralism may be particularly vulnerable to climate change (Burton, 2001; Bilsborrow, 2002). Urban population, on the other hand, frequently show high spatial and social segregation, concentration of poverty, over-spilling of growth in environmental fragile areas and ill prepared institutions (Satterthwaite and others, 2007; de Sherbabin and others, 2007b; Bull-Kamanga and others, 2003; Huq and others, 2007).
- (b) The internal dimension, that is, the influence of group, household and individual characteristics such as age, gender, race or ethnicity, education, household composition, life cycle and other. It is known that “vulnerability to climate change differs considerably across socio-economic groups” (Schneider and others, 2007, p. 784). Other things being

⁷ The AR4 defines adverse effects as harmful impacts, where impacts are changes in a system due to its exposure to climate change (Schneider and others, 2007)

equal, poor/deprived people facing environmental hazards are more vulnerable than the non-poor/affluent populations. Age, gender and other socio-demographic individual characteristics also define specific groups at risk.

Patterns and degrees of vulnerability differ across scales and levels of analysis. The AR4 recognized this critical aspect, stating that “the choice of scale at which impacts are examined is crucial, as considerations of fairness, justice or equity requires examination of the distribution of impacts, vulnerability and adaptation potential, *not only between, but also within*, groupings. Aggregation, whether by region, sector or population group, implies value judgments about the selection, comparability and significance of vulnerabilities and cohorts” (Schneider and others, 2007, p. 784). This may be particularly challenging for macro-level demography, which is based on highly aggregated data—often at the country level.

1. Population distribution patterns and trends and vulnerability to climate change impacts

World population is not uniformly distributed because of heterogeneous habitability (not all Earth’s biomes are suitable for humans), particular settlement history and regional variations in demographic dynamics, among other things. Table 1 displays the distribution of the world population by major area, region and rural/urban residence, in 2005. Three characteristics are apparent:

- (1) Developing regions, especially Asia, host most of the world’s population;
- (2) The percentage of the population that is urban is increasing, being estimated in almost 50 per cent worldwide for 2005 and almost 40 per cent in Africa and Asia, the least urbanized continents.
- (3) Less developed regions show large differences in terms of urbanization.

TABLE 1: WORLD POPULATION DISTRIBUTION

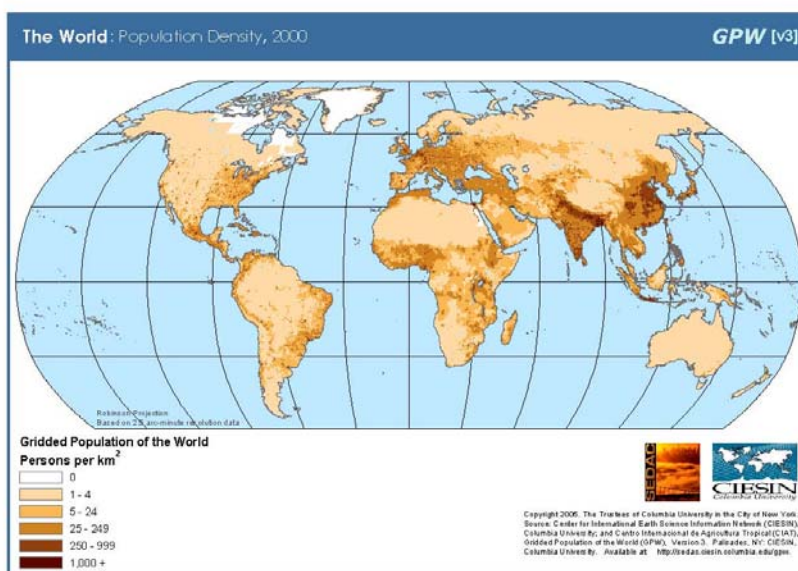
	Population 2005	Percentage of world population 2005	Percentage urban 2005
World	6’514,751	100.0	48.6
More developed regions	1’215,636	18.7	74.0
Less developed regions	5’299,115	81.3	42.7
Africa	922,011	14.1	37.9
Asia	3’938,020	60.4	39.7
Europe	731,087	11.2	71.9
Latin America and the Caribbean	557,979	8.6	77.5
Northern America	332,245	5.1	80.7
Oceania	33,410	0.5	70.5

Source: *World Population Prospects: The 2006 Revision* and *World Urbanization Prospects: The 2007 Revision*, Available from <http://esa.un.org/unup>.

It is estimated that about 30 per cent of the world’s population lives at or below an altitude of 100 meters, in an area comprising only 15 per cent of all inhabited land (Cohen and Small, 1998). On the other hand, 10 per cent of the world population lives in the highlands, which represent about 25 per cent of the Earth’s land area. Less than 200 million people, or 3 per cent of the world’s population, live in or near tropical rainforest (Kates and Haarmann, 1992, p. 6).

Figure 5 displays population density *ca* 2000. Coastal areas, where many big cities are located, are more densely populated in developed and developing countries alike. Areas with high population density include South and East Asia, India, the Gulf of Guinea in Africa, Europe, eastern North America, Central America and the coastal areas of South America.

Figure 5: World Population Density



Source: CIESIN and CIAT (2005).

Some of these regions and certain population groups within them are more at risk and have a lesser capacity to cope and adapt. Among the population groups most at risk are: significant portions of the population of developing countries; the population of coastal areas and small island states; the poor; the elderly and children; and households highly dependent on threatened physical systems, generally in rural areas (Leary and others, 2006; Bilborrow, 2002)

2. Future trends in population distribution

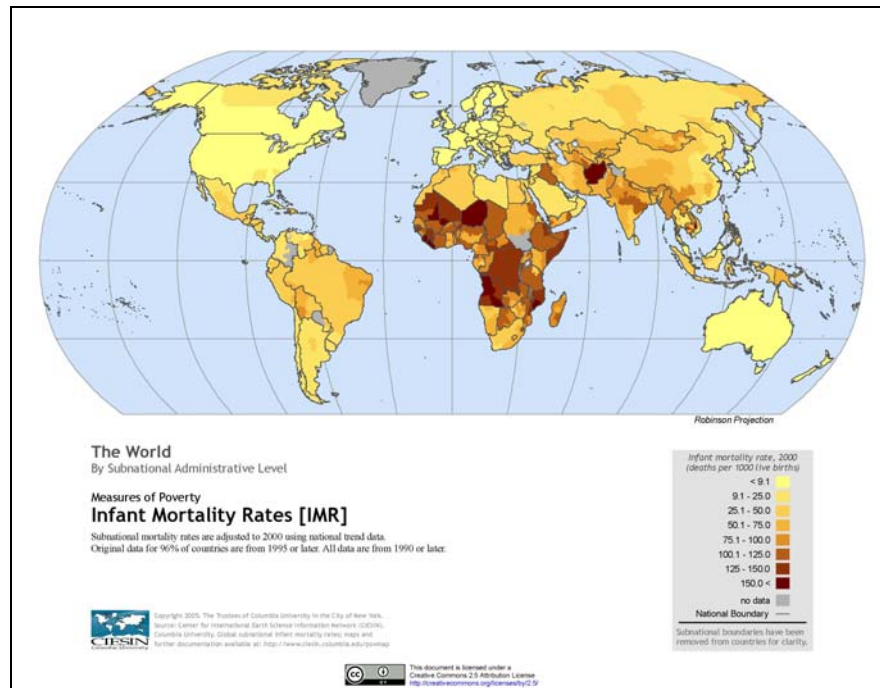
Future population trends can increase vulnerability to climate change impacts. Namely:

1. Population growth is expected to remain high in developing countries (particularly in Africa) due to high fertility and population momentum (large cohorts reaching reproductive age), despite recent declines in fertility levels (United Nations, 2009). The population of developing countries continues to suffer from poverty and deprivation and the institutional capacity to handle the impacts of climate change is still weak in these countries.

In addition, the proportion of children, inherently more vulnerable, is expected to continue growing in Africa and Asia. The highest infant mortality rates⁸ are currently found in sub-Saharan Africa countries, where population growth is expected to be highest and larger impacts of drought and water shortages and disruption of farming and pastoral systems are anticipated.

⁸ CIESIN's Poverty Mapping Project uses infant mortality rate as a proxy for poverty and welfare. Available from http://sedac.ciesin.columbia.edu/povmap/methods_global.jsp

Figure 6. Global sub-national map of infant mortality rates



Source: CIESIN (2005).

- Urbanization is also expected to continue as developing countries complete the urban transition (Martine, 2005; Satterthwaite, 2006; UNFPA, 2007). There are, however, marked differences across countries. For example, projected urban growth rates in sub-Saharan Africa for 2005-2010, range from 6.8 per cent in Burundi to 1.7 per cent in Swaziland. Urban population growth is the result of natural increase and rural-urban migration and the contribution of each component changes along the urban transition. Migration contributes more to urban population growth in early stages of urbanization, while natural growth becomes the main component of urban growth at more advanced stages. It is estimated that, currently, migration may contribute 40 per cent to population growth in cities in developing countries, with the notable exception of China, where it would contribute 60 per cent (Montgomery, 2008)

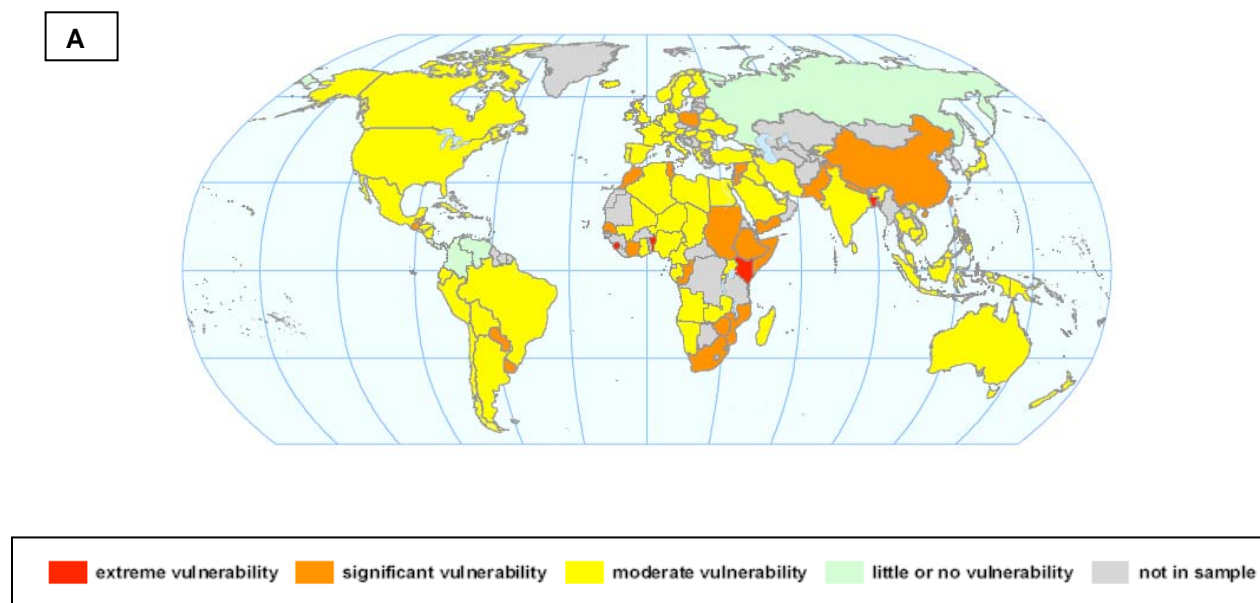
Concentration of people in large and middle-size cities is coupled with ongoing movement towards coasts in search of economic opportunities and amenities. The concentration of population in vulnerable cities—for example, those at risk of sea-level rise—increases the pool of people at risk of climate change events. Assuming that current migration patterns remained unchanged, migration flows are likely to increase the size of vulnerable populations in areas at-risk, namely coastal cities.

Yohe and others (2006), assess the distribution of national-level vulnerability to climate impacts using temperature changes from different ensemble climate scenarios and assumptions about adaptive capacities. Adaptive capacity for each country is assessed using a series of indicators for economic capacity, human and civic resources and environmental capacity from Brenkert and Malone (2005). Figure 7 presents the results of this simulation for an A2 emissions scenario with a climate sensitivity of

5.5°C and constant levels of adaptive capacity for 2050 (figure 7.A) and 2100 (figure 7.B).⁹ Vulnerability is assessed as the ratio of change in temperature to a change in adaptive capacity, where less than one means little or no vulnerability, 1 to 2 means moderate vulnerability, 2 to 3 means significant vulnerability and more than 3 means extreme vulnerability, “where the exposure to climate change will likely overwhelm the capacity to adapt” (Yohe and others, 2006, p. 37).

The assumptions underlying these maps are that adaptive capacity will not change (which is unlikely) and that the concentration of greenhouse gases will reach 550 ppm. Under this scenario, in 2050, three African countries (Benin, Kenya and Sierra Leone) and Bangladesh are expected to be extremely vulnerable and a large number of African countries as well as Poland, Syria, Jordan, Yemen, Nepal and China are expected to be significantly vulnerable. In 2100, almost every country is expected to be extremely vulnerable. Even where greenhouse gas reduction strategies are to be rigorously implemented so as to hold effective concentrations of greenhouse gases at 550 ppm, most developed countries are in the significant vulnerability category and developing countries in the extreme vulnerability category if there are no improvements in adaptive capacity by 2100. The authors recognize that this is mostly a “thought experiment,” since it is difficult to accurately predict future adaptive capacities. But it does show regions in which external (temperature induced) vulnerability will add on to internal vulnerability to produce significant risks for human development and in which major changes in the spatial distribution of population are likely if not inevitable.

Figures 7. Geographical Vulnerability to Climate Change in 2050 (A) and 2100 (B)



⁹ A climate sensitivity of this magnitude means that a doubling from 1990 carbon-dioxide concentrations in the atmosphere would yield a 5.5 °C increase in mean annual temperature.



Source: Yohe and others (2006b).

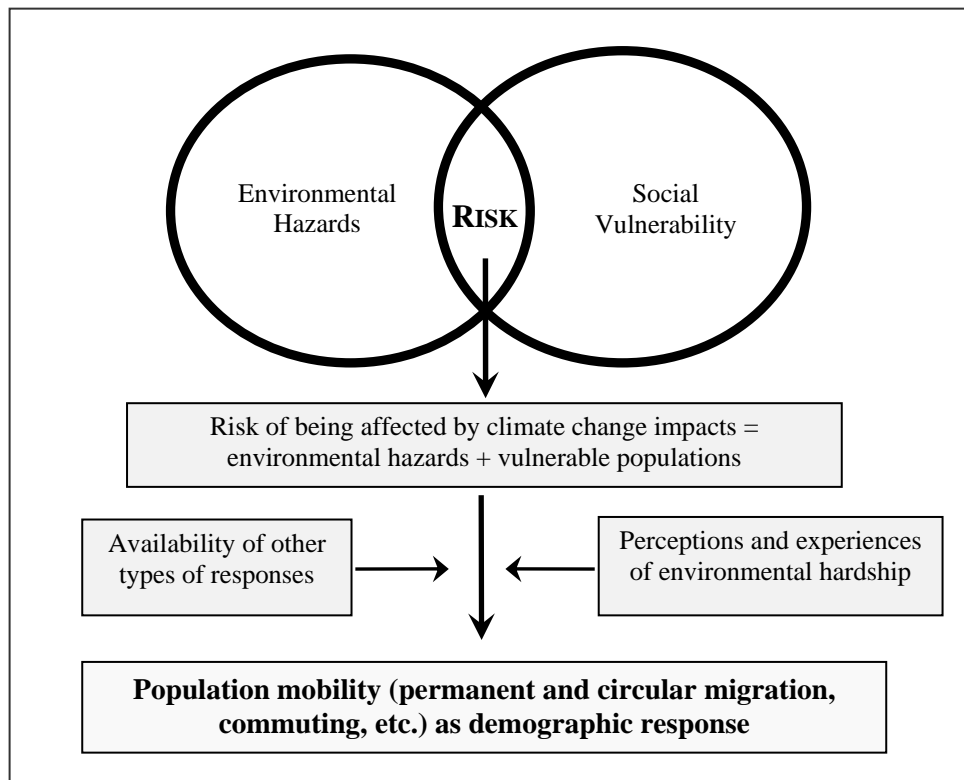
D. CLIMATE CHANGE AND POPULATION MOBILITY

1. Environmentally induced population mobility

The attribution of population movements to environmental factors is a delicate task. What constitutes an environmentally induced move is still under discussion. While, in the case of sudden natural disasters such as earthquakes, the influence of geophysical factors on mobility is immediately evident (Curson, 1989), the influence of environmental changes such as desertification or land degradation, characterized by cumulative changes or slow-onset disruption is less clear-cut (IOM/RPG, 1992, p. 12). Because of this ambiguity, the statistics available to assess the magnitude of the phenomenon are very diverse and it is also difficult to estimate future trends (Lonergan, 1998; Black, 2001). As a result, the growing consensus on the contribution of environmental factors to human mobility translates into only modest agreement about the mechanisms, character and extent of that contribution (IOM/RPG, 1992; IOM, 2007; Richmond, 1995; Hugo, 1996; Lonergan, 1998; Wood, 2001; Suhrke, 1993).

Figure 8 brings together the different factors that shape population mobility in response to the risk of being affected by climate change impacts, suggesting a way of integrating the issues discussed in parts B and C with the factors presented so far in part D.

Figure 8. Population mobility as demographic response to environmental hazards



Source: based on Hewitt (1997); Blaikie and others (1994); Meze-Hausken (2000); Adamo (2003).

a. Type of movements

The type of population mobility will now be looked at (short or long term, short or long distance, internal or international, permanent or temporary) and the factors that shape it. It is also necessary to consider:

- *The causes*: the specific environmental events leading to displacement, distinguishing between acute or sudden events and slow-onset or gradual processes;
- *The intensity and predictability* of the environmental events;
- *The scale or magnitude*, in terms of people displaced, area affected or duration of the event (IOM/RPG, 1992; Lonergan, 1998; Wood, 2001; Biermann and Boas, 2007; Renaud and others, 2007)

The issue of identifying the type of movement and the classification of movers as migrants, environmentally displaced people (EDP), or refugees, is among the major discussions in the migration and environment literature (Jacobson, 1988; Suhrke, 1993; Richmond, 1995; Hugo, 1996; Renaud and others, 2007) (see box 1).

Box 1. Definitions

There has been growing literature on “environmental refugees”, including climate refugees or refugees due to climate change, as those displaced by land loss, land degradation, or natural disasters (see IOM/RPG, 1992; Doos, 1997; Lonergan, 1998; Black, 2001; Urdal, 2005; Hunter, 2005). Although some argue that such refugees should be accorded the same rights as refugees from armed conflicts or natural disasters (e.g. Conisbee and Simms, 2003), the United Nations High Commissioner for Refugees and Governments in developed countries have been careful to identify people who have been forced out of an area owing to environmental concerns as “displaced persons” or migrants so as not to conflate them with refugees fleeing religious or political persecution, since the official status of “refugee” confers the holder with certain rights to assistance and asylum under international law.

The following definitions illustrate some of the conceptual fuzziness regarding environmentally displaced persons and refugees. For example, the first definition includes people who have crossed international borders as “displaced persons”, whereas the second explicitly indicates that displaced persons have not crossed an internationally recognized border.

Environmentally Displaced Persons: Persons who are displaced within their country of habitual residence or who have crossed an international border and for whom environmental degradation, deterioration or destruction is a major cause of their displacement, although not the sole one (IOM/RPG, 1992).

Internally Displaced Persons: Persons or group of persons who have been forced to flee or to leave their homes or places of habitual residence, in particular, as a result of, or in order to avoid the effects of, armed conflict, internal strife, systematic violations of human rights, or natural or man-made disasters, and who have not crossed an internationally recognized State border (OCHA, 2004).

Refugees: The 1951 Convention relating to the Status of Refugees defines a refugee as a person who, owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable, or, owing to such fear, is unwilling to avail himself of the protection of that country (IOM/RPG, 1992).

Environmentally induced mobility is often considered a type of forced migration on the basis that the move is involuntary and that a certain amount of coercion is implicit in the fact that push factors (e.g., slow-onset environmental processes as land degradation) are more important than pull factors (Suhrke, 1993; Hugo, 1996; Richmond, 1995; Stiles, 1997). Frequently, environmental push factors are related to economic factors, and in this sense “environmental” migrants are also economic migrants. But push factors may also be linked to the deterioration of local environmental conditions and quality of life in general (Izazola and others, 1998; Hunter, 2005).

Hugo (1996) suggests locating the different movements within a continuum from forced to voluntary mobility. At one end of the spectrum there would be refugee-like situations (low level of control over the process and high degree of vulnerability). At the other end, migrant-like situations would be characterized by greater control over the process and less vulnerability even if people are moving in response to deteriorating conditions. Between these extremes, environmentally driven mobility or displacement would be characterized as voluntary with more control over timing and direction and less vulnerability than refugees have, but less control and more vulnerability than economic migrants. In the same framework, Renaud and others (2007) propose to identify three categories—environmental refugees, environmentally forced migrants and environmentally motivated migrants—according to the nature or intensity of the hazard, the type of assistance available for the displaced population and the inherent vulnerability of the affected community. Similarly, Bates (2002) suggests also three categories—environmental refugee, environmental migrant and migrant—in a continuum from involuntary to compelled to voluntary decision to move.

Hunter (2005) listed a number of possible responses to sudden environmental hazards. In the case of natural disasters, the most common and faster response is evacuation, generally short distance and temporary, although some evacuees may choose to relocate (as has happened with some evacuees from New Orleans following Hurricane Katrina). A different response is the relocation of communities to less dangerous places, generally a permanent move. In developing regions, permanent environmentally induced displacement happens in a less organized way, following general migrations trends (for example, rural-urban migration flows). Permanent displacement is usually local and not international. However, spontaneous relocation may not be possible locally if the surrounding area is densely populated or land owners refuse to allow resettlement.

b. Characteristics of the flows

Environmental displacement may differ from ‘normal’ flows in terms of the age and sex composition of migrants, type of movement and even destinations. By far, most of the environmentally induced mobility—both slow-onset and sudden disasters—has been internal (within nations) and short term (Hugo, 1996; Myers, 2002; Hugo, 2006; Massey and others, 2007). Some evidence shows that the spatial distribution of pre-existing migrant networks and other forms of social capital (what Hugo (1996) would call “facilitators and constraints”) are relevant to estimate the probability of local or long-distance moves, and the probability of return (McLeman and Smit, 2006).

Research on migration and drought in the Sahel found diversification of migration patterns during drought periods. Although the flows did not intensify, they were different in composition, including a higher number of women and children, likely a strategy to reduce the number of consumers in the household. There was also a shift to circular patterns and short-cycle labour migration and changes in destinations and in the number of moves. Remittances from long-term migrants were still essential to the families, but households also put more workers in the local labour market. The temporary migration of young male members to increase income and reduce consumption was part of the strategy (Findley, 1994; Brown, 2007)

There is also selectivity by socioeconomic status of individuals and households, a key determinant of the degree of vulnerability. Research in Nepal (Massey and others, 2007) found that local environmental deterioration may have provoked short-distance movements of males and females, but had a weaker effect on long-distance moves, and that this finding only pertained to lower castes. In the Sahel, a good or bad harvest (as indicator of wealth or availability of resources) determines a household’s choice between long- or short-distance migration (Brown, 2007). Studies in the United States found that lower socioeconomic status was linked to a higher probability of relocation after a hazard event (Hunter, 2005). Potential explanations were that better-off households had more resources to afford rebuilding, had insurance, or suffered less damage because of the ability to meet the expense of mitigation measures. On the other hand, Izazola and others (1998) found that middle- and upper-class household in Mexico City were more likely to relocate outside the city because of air quality deterioration.

2. Potential population displacements from climate change events

This section will look at the potential causes of mobility through a discussion of the intensity and predictability of environmental events, distinguishing between acute/sudden events and slow-onset/gradual processes; types of mobility (e.g., short or long term, short or long distance, internal or international, permanent or temporary); and scale or magnitude, in terms of population displaced, area affected, or duration of the events.

The effects of climate change events are expected to vary by region and trigger different levels of population displacements depending on the specific place and time of the impact, the degree of vulnerability of the affected population and the presence of alternative responses. Overall, it is expected that more developed regions will be able to adapt *in situ* to a larger extent than developing regions, where the probability of displacement will increase. Socioeconomic status may then become an important predictor. Population mobility as a response is not cost-free; it requires resources. When a household or individual becomes too poor to “invest” in migration, then they need to stay put and hope the situation improves.

a. The causes and types of mobility

In part B, three main climate change impacts: drought and water availability, extreme weather events and sea-level rise, were discussed in relation to their potential effect on population displacements. However, the intensity of these events and their predictability are difficult to assess and so is the potential population displacement and its characteristics. The particular degree of vulnerability of the population in different affected areas and the existence of available options to mobility are important factors that could also make a difference in the outcome.

Sea-level rise appears to be the most certain impact leading to displacement and resettlement (Hugo, 1996; Black, 2001; McGranahan and others, 2007; de Sherbinin and others, 2007b). Barring the development of major coastal flood control infrastructure, a certain area will be under sea-level given a certain progression of melting of the Greenland and Antarctic ice caps. Sea-level rise is expected to be relatively gradual (slow onset) and its timing is contingent on the progression of ice cap melting (Dasgupta and others, 2007), but it is highly probable that some degree of sea-level rise—probably a minimum of one meter—will occur.

Populations living in coastal areas facing sea-level rise have different options for adaptation, including mobility. Those who choose to move are likely to relocate to higher ground nearby providing that there are land resources to accommodate them. Rural populations without nearby land resources are likely to move to urban areas, or become part of rural landless populations. There could be progressive movements, probably voluntary, but most likely a permanent movement or at least long-term.

Coastal flooding from storm surges and excess precipitation, by contrast, is generally a sudden event and is less predictable (although early warning systems are improving with consequent decreases in flood mortality). Nevertheless, certain areas are more vulnerable to flooding owing to topography and distance to the coast and hence it may be anticipated that there will be some combination of relocation in advance of events and some short-term displacements in the aftermath. The poorest populations will be those with the fewest resources to permanently relocate, but often live in the most vulnerable locations. On the other hand, relatively better off land owners are those with greater incentives to remain on their lands, so, overall, it is not easy to predict who will move.

Although the result of a different type of hazard, it could be illustrative to mention very preliminary results of on-going research on the aftermath of the 2004 Tsunami in Sumatra, Indonesia. They indicate that rates of displacement were much higher in areas with severe damage, while re-location took place mostly in nearby areas with only 0.4 per cent of the affected population emigrating internationally. Age, gender and education seem to have significant effects on displacement in affected and unaffected areas. Less educated individuals from the most severely damaged areas were much more likely to be in camps than in private homes (Gray and Sumantri, forthcoming).

Extreme weather events are likely to trigger local sudden and massive displacements from the affected areas. The key factor here is the predictability of the event and the government and civil capacity

to face it. This type of movement will probably be short-distance and not permanent. Selectivity by socioeconomic status is possible. A study on the impact of hurricane Andrew in South Florida (United States) in 1992 found that 300,000 people were displaced temporarily, 80 per cent returned home within a month of the hurricane and 40,000 left permanently. Most of the moves were local (within the same county) (Smith and McCarty, 1996). Also in Florida, during the 2004 hurricane season, an estimated one quarter of the population evacuated prior to at least one hurricane, returning after a few days. The main factors affecting evacuation were the strength of the hurricane and the vulnerability of the dwelling; presence of children in the house; and ownership of the house, which had a negative effect on mobility (Smith and McCarty, 2009).

Climate change impacts on freshwater resources and productive systems described in part B include droughts, water scarcity and glacier melting. These are typically slow-onset events that take months to years to unfold. Previous research found that significant factors associated with departures were the severity of the climatic event, human vulnerability and the type and diversification of local survival strategies. Vulnerable households in drought-prone regions have developed a number of coping strategies in the face of prolonged drought, including (but not limited to) different forms of mobility of the household members. Overall, prolonged droughts result in disruption of livelihoods, progressive impoverishment and general deterioration of population's living conditions.

In the case of drought and water scarcity events, migration as adaptive response is likely to rest on already established patterns of population mobility (Hugo, 1996; Adamo, 2003). Because of the gradual character of the hazard, labour circular migration of some household members (generally young adults) could be expected (Brown, 2007). However, depending on the severity of the impact, these long-time adaptations may not be enough and more permanent migrations are possible (Tacoli, 2007).

A substantial number of studies have addressed the effects of drought and rainfall variability in general in sub-Saharan Africa. Caldwell's review of the demographic consequences of the 1970s Sahelian droughts (Caldwell, 1975, p. 27) highlighted the importance of migration (a long-time adaptation to local conditions) in securing survival to the drought and better living standards during the crisis. He found that migrants tended to concentrate in drought-free areas, which offered the best possible conditions under the circumstances, moving southward of the typical area of cyclical migration, looking for better watered areas and towns. Monimart (1989) also makes a clear distinction between drought-related and labour-related migration. Migration triggered by drought responds to emergency situations, is driven by despair and famine and may include the whole household or just the adult male members. Labour migration, generally non-permanent, includes almost exclusively men and has been established for a long time in the area. The main effects of drought are to increase its intensity and to delay the return.

In her study of rural Mali, Findley (1994) found changes in the established migration patterns, which she linked to the 1983-85 drought. First, although migration levels did not increase, the composition of the flows changed to incorporate more women and children as families attempted to reduce the number of consumers. Second, short-cycle circulation increased at the expense of long-term migration and destinations changed accordingly with an important proportion of migrants going to national instead of international destinations. Third, families became more dependent on remittances from migrants.

In his research about Ethiopia, Ezra (2001) found that the movement of people out of the villages located in the drought-prone northern Ethiopia was one of the survival strategies adopted during the 1980s droughts. Like Findley, he did not find a direct reference to "drought" or other environmental reason for moving. Intensity of migration was higher in drought years and in subsequent years (Ezra and Kiros, 2001). Meze-Hausken's (2000) study on drought-induced migration in Ethiopia highlighted the mechanisms that trigger departure, combining severity of the climatic event, human vulnerability and

survival strategies. A remarkable finding of her study was that initial differences in vulnerability to drought-induced migration, based in households' prior socio-economic and demographic conditions, gradually disappear as an absolute limit is reached in terms of water and food availability and the coping mechanisms *in situ* fail.

Research on Burkina Faso using national survey data (Henry, Boyle and Lambin, 2003; Henry, Schoumaker and Beauchemin, 2004) found that regional environmental characteristics (rainfall variability, land degradation and land availability) were significantly associated with internal migration patterns in the country, net of socio-demographic variables. This research also found that slow-acting processes such as land degradation seemed to have a larger effect than single events such as droughts or rainfall variability. A possible explanation was that land degradation progressively reduces the effectiveness of farming livelihood strategies, while a number of coping mechanisms have been developed over time to overcome rainfall shortages and variability. Climatic events turned out to be significant after controlling by place of origin, place of destination and duration of the move. People living in drier rural areas were more likely to leave for another rural area and were also more likely to engage in short-term migration than people living in wetter regions.

In Latin America, Carvalho (2002) relates changes in migration patterns in the Brazilian Semiarid Northeast since the 1970s (including return migration, intensification of circular migration and the emergence of new destinations) to changes in the demand of local and national labour markets and economic restructuring, but also to the displacement effects of periodic droughts. The accelerated urbanization of the area is a consequence of these new patterns that originated in the rural areas of the Northeast and ended in the region's small towns instead of large metropolitan areas. In Mexico, desertification has influenced migration indirectly, by contributing to increase poverty among small farmers in the country's dry lands (Middleton and Thomas, 1997). In Argentina dry lands, one study found that rainfall variability, drought and land degradation, may have a direct effect on the livelihoods of small farmers and an indirect effect on local communities through impacts on labour demand and increasing environmental hardship. These effects may trigger different types of mobility (seasonal, circular), among other responses (Adamo, 2003).

Should periodic drought evolve into a prolonged drying trend, as is predicted under certain climate scenarios, then it is likely that regions currently suitable for rainfed agriculture in semi-arid and sub-humid areas will be abandoned in the absence of the construction of irrigation infrastructure. However population numbers and densities in these regions are already low, so migration numbers would be lower than for coastal population displacements induced by sea-level rise. The southern Mexico and portions of Central America, southern Argentina, portions of Mauritania and South Africa, portions of Central Asia and southwestern Australia are among these regions, as shown in figure 1. Poor rural agrarian populations are most likely to move to nearby towns and cities, though younger household members may move to large cities. If one tallies all the current population living in areas in which runoff will decline by more than 20 per cent by 2080 (as per figure 1), the total is close to half a billion. However, not all of these areas will be abandoned.

Another source of population displacement would be, paradoxically, anthropogenic environmental changes related to large-scale adaptation works (water transfer schemes, flood defenses, etc.). China, for instance, is investing heavily in large dams and water-transfer schemes from the humid south to the drier north that have already displaced more than a million of people (Jackson and Sleigh, 2000; Yardley, 2007). It is likely that other countries will implement similar climate change adaptation infrastructure plans, and even flood defenses are likely to involve the local resettlement of large populations.

The direction of the flows is rather uncertain, although there are indications—based on the migration systems already in place and on previous research on the topic—that most environmentally induced migration would remain within national boundaries, particularly in the case of sea-level rise, eventually increasing the numbers of internally displaced persons (IDPs) (WBGU, 2007). The Chitwan Valley (Nepal) study (1996-1999) found that environmental conditions effected local moves, net of other factors. The main effects corresponded to perceived decline in agriculture productivity and time to gather firewood. Productivity decline also affected distant moves with a smaller coefficient. The authors concluded that, as environmental conditions deteriorate, people do leave but stay mostly in their region. Distant and local moves are affected differently or not at all (Massey and others, 2007).

Where international migration takes place, the direction of flows will likely be determined by prior migration ties between sending and receiving countries and on political considerations within receiving countries. An example of this would be mass migration from Central America and the Caribbean to the United States, increasing the magnitude of current flows (WBGU, 2007, p. 151). International migration is highly likely and indeed may be the only option in the cases of small-island states and countries that share threatened coastal areas.

Although much concern in developed countries has centered on the potential for major flows from developing countries, the United Nations High Commissioner for Refugees (UNHCR) (2003) reports that two-thirds of current refugees are housed by developing countries. Of all countries providing asylum to more than 100,000 refugees at the end of 2006 (table 2), three-quarters are low or lower middle income countries. Involuntary displacements of the type that might be expected in extreme climate events are, typically, to neighboring states and the resources of these groups are often inadequate to launch a major move to developed countries in the absence of organized relocation programmes.

There is also potential for the disruption of current migration flows because of increasing environmental risks in destination areas, for example, in coastal urban areas affected by sea-level rise or agricultural areas affected by changes in rainfall patterns¹⁰.

TABLE 2. REFUGEE POPULATIONS BY COUNTRY/TERRITORY OF ASYLUM, COUNTRIES WITH REFUGEE POPULATIONS OF GREATER THAN 100k (2006)

Country/territory of asylum ¹	Refugees ²	Country/territory of asylum ¹	Refugees ²
Pakistan	1,044,462	Saudi Arabia	240,772
Islamic Rep. of Iran	968,370	Congo, D.R.	208,371
United States	843,498	Sudan	196,200
Syrian Arab Rep.	702,209	India	158,366
Germany	605,406	Canada	151,827
Jordan	500,229	France	145,996
Tanzania	485,295	Thailand	133,117
United Kingdom	301,556	Nepal	128,175
China	301,027	Zambia	120,253
Chad	286,743	Armenia	113,714
Kenya	272,531	Netherlands	100,574
Uganda	272,007		

Source: UNHCR (2006).

¹ In the absence of Government figures, UNHCR estimated the refugee population in most industrialized countries.

¹⁰ In addition to this, migrants in these areas may be more vulnerable; examples include Mexican migrants in the Katrina disaster, and Asian migrants in the Tsunami disaster (Findlay, 2005).

² Persons recognized as refugees under the 1951 UN Convention/1967 Protocol, the 1969 OAU Convention, in accordance with the UNHCR Statute, persons granted a complementary form of protection and/or those granted temporary protection.

b. The scale of mobility

Estimates of the potential magnitude of climate change-related displacement vary broadly depending on the data sources and projection or estimation methods. However, the “methods” often appear to be little more than back-of-the-envelope calculations. Bierman and Boas (2007) strongly warn about some of the issues surrounding future estimates of the magnitude of environmentally displaced populations. Some of these issues are: (1) lack of agreement on the definition of climate migrants; (2) use of broad concepts of climate migrants; (3) assessments built on general assumptions on human behavior; (4) lack of consideration of changes in human behavior leading to different adaptive practices; and (5) lack of recognition that climate change may be one reason to migrate, but not the only one and often not the most important. In addition to this, Castles (2002) cites the use of different information sources (broad-ranging global prognosis on population growth, climate change and resource constraints, national or local studies of specific situations).

Box 2 lists some estimates frequently cited in the literature about climate change and migration and describes how they were obtained.

Box 2: Frequently cited (crude) estimates of population at risk of displacement due to climate change impacts

- *People at risk of sea-level rise by 2050: 162 million; People at risk of droughts and other climate change events by 2050: 50 million (Myers, 2002).*

- The complete quote reads: “Preliminary estimates indicate that the total number of people at risk of sea level rise in Bangladesh could be 26 million, in Egypt 12 million, in China 73 million, in India 20 million, and elsewhere, including small island states, 31 million, making a total of 162 million. At the same time, at least 50 million people could be at severe risk through increased droughts and other climate dislocations”
- There is no mention of how these ‘preliminary estimates’ were obtained. In a previous paper, Myers and Kent (1995:1, footnote 1) stated that their findings (200 million people potentially at risk of displacement due to predicted climate change impacts) were based on (a) consultations with representatives of governments, intergovernmental bodies, United Nations agencies, the World bank, and dozens of NGOs including refugee organizations; (b) expert opinion of leading scientist and policy analysts all over the world; (c) experience of field workers with “extensive and firsthand knowledge”; (d) six case studies extensively documented (Haiti, Mexico, Greater Caribbean, Egypt and North Africa; the Horn of Africa and Kenya, and Bangladesh); (e) an exhaustive literature review.

- *People potentially at risk of being displaced because of desertification: 135 million (Almería Statement, 1994)*

- The document does not mention the sources of the estimation. “It is estimated that over 135 million people may be at risk of being displaced as a consequence of severe desertification”

- *Number of people who have fled because of floods, famine and other environmental disasters: approximately 24 million (UNHCR, 2002, p. 12)*

- There is not mention of sources.

- *Environmentally displaced people by 2010: 50 million (UNFCCC, 2007, p. 42).*

- This publication cites numbers from the United Nations University Institute for Environment and Human Security (UNU-EHS), which “predicts that by 2010 the number of environmental refugees could grow to 50 million”. This “prediction” was apparently made during a statement for the UN Day for Disaster Reduction.

- *People who could be displaced by climate change by 2050: 1 billion (Christian Aid, 2007, p. 22)*

- The number is based on the IPCC 2007 Report’s estimation of people *affected* by climate change by 2080. The exact quote reads “It was estimate that, unless strong preventative action is taken, between now and 2050 climate change will push the number of displaced people globally to at least 1 billion”. However, the report also includes this warning “There are no recent, authoritative, global figures on the number of people who could be displaced from their homes by climate change”

- *People estimated to become permanently displaced “climate refugees” by 2050: 200 million (Stern, 2006).*

Source: Based on Myers and Kent (1995)

In general, these estimates tend to show populations at risk—even UNHCR (2006) cites population at risk as a surrogate for the population displaced. But, as Black (2001) argues “calculating the population ‘at risk’ from sea level rise is a long way from predicting mass flight of a ‘refugee’ nature”. The consideration of different time ranges (for example 10 or 50 year projections) also makes comparisons difficult.

Despite the weaknesses of these estimates, there is little doubt that some areas and populations are considerably more at risk of certain impacts. Coastal areas and small island states (SIS) are particularly threatened by sea-level rise and extreme weather events (Bijlsma, 1996; Hugo, 2006).¹¹ In these cases, migration may be the only adaptive response, particularly if sea-level rises faster than predicted. In the case of SIS in particular, relocation and resettlement policies have been discussed (Adger and others, 2007). It may be that it is the percentage of population affected by sea-level rise and not the absolute numbers that will better predict the likely international migration flows, since one might expect that the higher the percentage the more likely it is that indigenous coping capacities will be overwhelmed. Table 3 shows that the regions with the highest percentage of the population affected by a one-meter sea-level rise are the Middle East and North Africa (3.2 per cent, largely determined by the Nile delta) and East Asia (2.0 per cent). The basic pattern remains similar in the case of a 5 meter sea-level rise, but the percentages increase to 7.5 per cent for the Middle East and North Africa and 8.6 per cent in for East Asia. Figure 9 shows the 10 countries with the greatest percentage of current population that would be affected by a 1 meter sea-level rise.

TABLE 3. PERCENTAGES OF SELECTED INDICATORS (BASELINE 2000) POTENTIALLY AFFECTED BY 1 AND 5 METER SEA-LEVEL RISES (SLR) BY REGION]

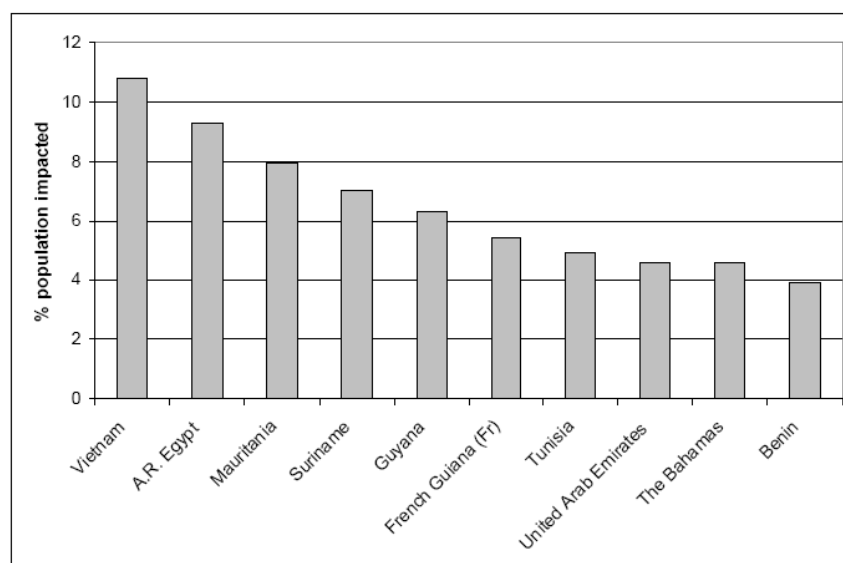
Indicators (percentage of total)	World	LAC	MENA	SSA	EA	SA
1m SLR						
Area	0.31	0.34	0.25	0.12	0.52	0.29
Population	1.28	0.57	3.20	0.45	1.97	0.45
GDP	1.30	0.54	1.49	0.23	2.09	0.55
Urban extent	1.02	0.61	1.94	0.39	1.71	0.33
Ag. extent	0.39	0.33	1.15	0.04	0.83	0.11
Wetlands	1.86	1.35	3.32	1.11	2.67	1.59
5m SLR						
Area	1.21	1.24	0.63	0.48	2.30	1.65
Population	5.57	2.69	7.49	2.38	8.63	3.02
GDP	6.05	2.38	3.91	1.42	10.20	2.86
Urban extent	4.68	3.03	4.94	2.24	8.99	2.72
Ag. Extent	2.10	1.76	3.23	0.38	4.19	1.16
Wetlands	7.30	6.57	7.09	4.70	9.57	7.94

Source: Dasgupta and others (2007, p. 41).

NOTE : LAC: Latin America and the Caribbean; MENA: Middle East and North Africa; SSA: sub-Saharan Africa; EA: East Asia; SA: South Asia.

¹¹ The case of Tuvalu is the classical example.

Figure 9. Countries most impacted by a 1 meter sea-level rise



Source: Dasgupta and others (2007)

c. Migration, adaptation to climate change and security concerns

Involuntary displacement as a response to climate change is likely to disrupt livelihoods, leading to further impoverishment of already vulnerable populations (Vine, 2005). Studies of the impacts of climate change on vulnerable populations have focused on concerns about the security of individuals, households and communities and their coping and adaptation capabilities (Bogardi, 2004; Renaud and others, 2007). This approach to human security rests on human agency, rights and sustainable livelihoods as means to face vulnerability (Bohle, 2007). In relation to climate change, this approach favours the concept of *in situ* adaptation, including risk management and vulnerability reduction, mainly through poverty reduction and good governance (IUCN and others, 2004). The aim is to increase the resilience of households, communities and nations, thereby reducing vulnerability, livelihood disruption, involuntary displacements and relocation.¹²

From a different perspective, climate change, environmental degradation and growing resource scarcity have been found to influence the emergence or aggravation of conflicts. Although the evidence shows that these conflicts are usually not violent, they constitute potential threats to global and national security¹³ (Castles, 2002, p. 6; Stern, 2006). Scenarios describing massive environmentally induced displacements often accompany these sober “prognoses,” capturing some of the issues found in the literature on environmental refugees (i.e. Reuveny, 2005; WBGU, 2007; Campbell and others, 2007; Gleditsch and others, 2007; Urdal, 2005).

In 1990, the IPCC’s First Assessment suggested that the greatest effect of climate change on society could be human migration, meaning involuntary forms of displacement and relocation (OSCE,

¹² The Institute for Environment and Human Security of the University of the United Nations addresses these issues. Available from <http://www.ehs.unu.edu/>.

¹³ For a comprehensive approach to these issues see the “Environmental Change and Security Programme” of the Woodrow Wilson International Center for Scholars, particularly the *ECSP Reports*. Available from http://www.wilsoncenter.org/index.cfm?fuseaction=topics.home&topic_id=1413.

2005). The general notion seems to be that temporary and permanent displacement and migration are less desirable forms of adapting to climate change. They are portrayed, in conjunction with relocation and resettlement, as a last-resort coping strategy when other adaptation possibilities are unavailable or fail.

In contrast to these somewhat pessimistic views, it is recognized that there are situations in which population mobility constitutes a powerful adaptive strategy. The AR4 reaffirms the importance of focusing on already established migrant networks and patterns as part of the inventory of adaptation practices, options and capacities (Adger and others, 2007, see particularly page 736, Box 17.8). The report takes into consideration many of the issues already mentioned here, for example the existence of multiple determinants of migration, the different forms of population mobility, the selectivity issues as well as the co-existence of migration with other possible responses to climate change impacts.

E. CONCLUSION

In this paper the focused was on climate change and its impact on the spatial distribution of populations, especially vulnerable populations and on migration. The scientific research on climate change impacts, vulnerability and environmental migration was reviewed in an effort to ascertain the likelihood and scale of major population displacements resulting from climate change. To accomplish this, the spatial aspects of the interaction between climate change and demographic variables was assessed and the literature on vulnerability and what is known concerning environmental factors that may influence displacement and migration were reviewed.

Overall, though there is a good deal of uncertainty concerning the likelihood, size and timing of climate induced migration, on balance, there is good reason to believe that climate change could engender significant disruptions to livelihoods, which in turn will result in some portion of populations (particularly rural, resource-dependent populations) being induced to migrate in search of alternative livelihoods. The potential for climate-induced hazards to increase in frequency or severity could also result in some level of displacement, though it is generally temporary unless the disaster event reaches some critical threshold. The evidence for permanent displacement from natural disasters is relatively slim. The droughts of the 1970s and 80s in the Sahel probably accelerated regional urbanization rates, but it is difficult to separate the drought-induced component from the baseline “development” component. The best current day evidence available for such displacements is from the aftermath of Hurricane Katrina, which struck New Orleans in 2005. As of 2009, the New Orleans metropolitan area had 170,000 fewer residents than before that event and approximately one-third of those displaced have permanently resettled elsewhere. It may be that the hurricane brought a new awareness of inherent vulnerabilities of living below sea level on the Gulf Coast of the United States.

The classic way of projecting population with its assumptions of progressive changes in fertility, mortality and migration, does not incorporate any type of environmental feedbacks or constraints or any consideration of abrupt changes in the underlying conditions, in the calculations. This is a known issue. For example, Cohen (1998) has proposed the incorporation of limiting factors into population projections and estimates, particularly in long-term projections. Depending on the scope, scale and purpose of the projection, these external factors may include government migration policies, regional water shortages or local limited agriculture potential. Given the information presented in previous sections about the likely impact of climate change events on population distribution and migration, this is an option to be considered in the near future, though the uncertainties and specific feedbacks are difficult to fully anticipate. It may be advisable for projections to take a more probabilistic or scenario-based approach, incorporating climate-related issues and related assessments within the projection guidelines and considering the implications of each climate change event separately, in order to address specific vulnerabilities, groups at risk and displacement potential.

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URBAN POPULATION DISTRIBUTION AND THE RISING RISKS OF CLIMATE CHANGE

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Future population growth will not only be predominantly urban and concentrated in Asia and Africa (United Nations, 2006), it will also face new challenges from a changing environment (McGranahan and others, 2005; Montgomery and others, 2003). In the twenty-first century, urban centres will not only need to sustainably provide safe water, sanitation, housing, health services and infrastructure for large numbers of current and new urban inhabitants, they will also need to do it in a manner that is compatible with current climate change scenarios. In particular, coastal cities—with increased risk of seaward hazards due to cyclones and flooding, not to mention longer-term expected sea level rise—may experience different challenges than cities in other environments (McGranahan and others, 2007). Large dryland cities will face new, perhaps more complex, challenges in the future than smaller counterparts in the past. The community of demographers, planners and development agencies need to embrace these new complexities if their efforts are to be of practical value to the well-being of urban dwellers of the twenty-first century.

A few years back, perhaps confirming ample casual evidence, the first systematic assessment of the distribution of human population found that people tend to live at low elevation and near sea-coasts and rivers (Small and Cohen, 2004). These estimates were further refined to show that nearly one in five persons globally lives in close proximity to a coast (i.e., within a coastal ecosystem) and that 65 per cent of the coastal population lives in urban areas (McGranahan and others, 2005). More than a quarter of the global urban population—or about 745 million persons in 2000—live in coastal settlements of more than 5,000 persons (with 90 per cent of these residents in settlements of 100,000 persons or more) (McGranahan and others, 2005). In further work, it was found that 75 per cent of countries with populations of at least one million persons have their largest city at close coastal proximity and at least partly situated at low elevation, i.e., below 10 metres (McGranahan and others, 2007). Furthermore, of the world's cities with more than five million inhabitants, at least one-fifth of their population and one-sixth of the land area are situated in a low elevation coastal zone.

The recent assessment by the International Panel on Climate Change (IPCC, 2007) finds that climate change is largely a consequence of anthropogenic factors. At the same time, people—and the environments that they live in—will also be the prime recipient of the consequences of climate change. In the 4th assessment, the IPCC clearly identified urbanization as a cause for concern, particularly in Africa and Asia, where the bulk of future population growth is expected to occur. In Africa, the IPCC anticipates that “towards the end of the twenty-first century, projected sea-level rise will affect low-lying coastal areas with large populations. The cost of adaptation could amount to at least 5 to 10 per cent of gross domestic product” (IPCC, 2007, Table SPM 2, p. 10). In Asia, “coastal areas, especially heavily populated mega-delta regions in South, East, and Southeast Asia, will be at greatest risk due to increased flooding from the sea, and in some mega-deltas, flooding from the rivers.” The IPCC expects this to raise morbidity and mortality due to diarrhoeal diseases. Furthermore, “climate change is projected to compound the pressures on natural resources and the environment, associated with rapid urbanization, industrialization and economic development” (IPCC, 2007, Table SPM 2, p. 10). The climate science community has clearly put urbanization on its agenda. Now it is time for the demographic community to put climate change on its own agenda.

This paper will focus on issues of urbanization and climate change primarily in coastal zones. Human settlement by definition, leads to environmental transformation. Coastal settlement can be environmentally damaging; among other, it may accelerate coastal erosion and lead to the development of misplaced landfill. In addition, coastal localities are environmentally vulnerable due to seaward hazards such as storm surges, coastal flooding and erosion. Climate change, which will bring sea-level rise and greater storm intensity, amplifies the risks to coastal settlements. Yet coastal zones are densely populated and appear to have experienced more growth than other ecological zones (Balk and others, forthcoming).

To address the potential consequences of urbanization with respect to climate change, a spatial framework is a necessary component. In McGranahan and others (2007), low elevation coastal zones are defined as contiguous coastal land less than 10 metres in altitude. All data, including population and urban extent (sources noted below) are spatially defined.

A. METHODOLOGY

McGranahan and others (2007) integrated recently-developed spatial databases of finely resolved global population distribution, urban extents and elevation data to produce country-level estimates of urban land area and population in low elevation coastal zones. By overlaying geographic data layers, the population and land area within the low elevation coastal zones were calculated and summarized by country, region and economic grouping. Shuttle Radar Topography Mission (SRTM) data were used to delineate a low elevation coastal zone, including land area, contiguous with the coast up to 10 metres in elevation. Urban extents were taken from Columbia University's Center for International Earth Science Information Network's Global Rural Urban Mapping Project (GRUMP). These urban extents were primarily delineated using the National Oceanic and Atmospheric Administration's night-time lights satellite data (city lights 1994-1995) verified with additional settlement information and represent urban agglomerations including surrounding suburban areas. Population and land area were also taken from GRUMP, which provides these data as gridded surfaces globally based on geo-referenced census data with population allocated between urban and rural areas as delineated by the urban extents. All data are expressed at one km resolution. Figure 1 illustrates the data layers with which the calculations were made for the Bay of Bengal region of Bangladesh.

B. FINDINGS

Low elevation coastal zones account for approximately only 2 per cent of the world's land area, but contain 10 per cent of the population and 13 per cent of the urban population. As illustrated in table 1, about two-thirds of the population living in low elevations coastal zones are in Asia. Yet even in Africa, which has only 1 per cent of its land in the zone and a comparatively high share of its population engaged in inland agriculture, 7 per cent of the total population and 12 per cent of the urban population live in these zones.

Figure 1. Map of Bangladesh identifying low elevation coastal zone and urban extents

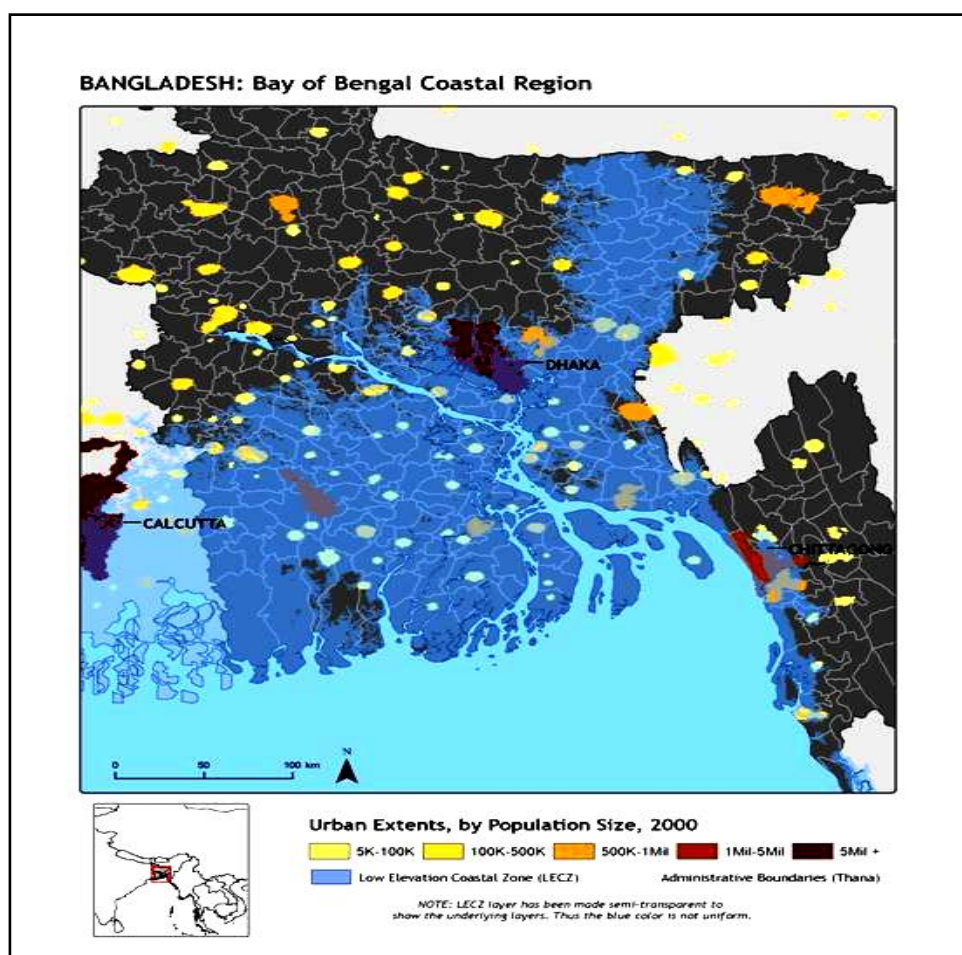


TABLE 1. POPULATION AND LAND AREA IN LOW ELEVATION COASTAL ZONE BY REGION, 2000

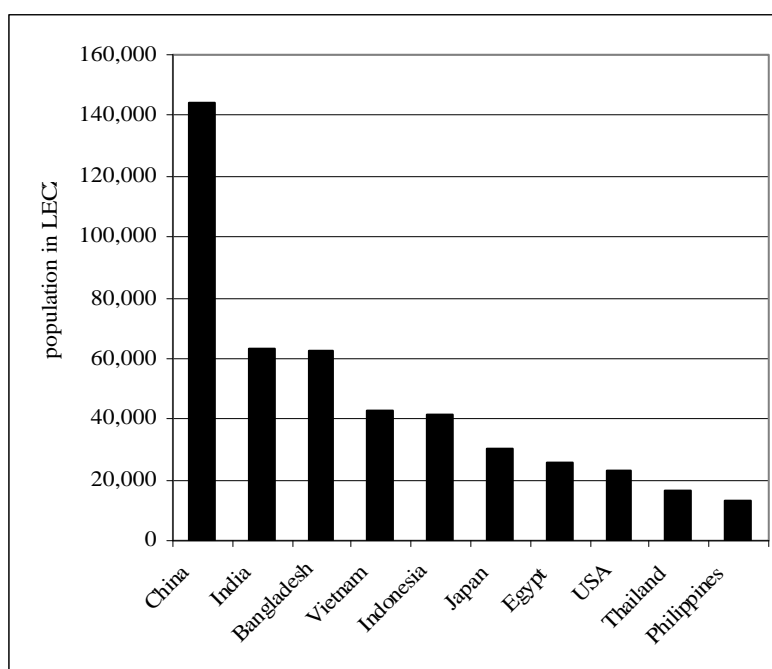
Region	Region's populations and land areas in low elevation coastal zones				Shares of region's population and land in low elevation coastal zones			
	Total Population	Urban population	Total Land	Urban Land	Total Population	Urban population	Total Land	Urban Land
	(millions)	(millions)	(thousand km ²)	(thousand km ²)	(per cent)	(per cent)	(per cent)	(per cent)
Africa	56	31	191	15	7	12	1	7
Asia	466	238	881	113	13	18	3	12
Europe	50	40	490	56	7	8	2	7
Latin America	29	23	397	33	6	7	2	7
Australia and New Zealand	3	3	131	6	13	13	2	13
North America	24	21	553	52	8	8	3	6
SIS	6	4	58	5	13	13	16	13
World	634	360	2 700	279	10	13	2	8

Source: McGranahan, Balk and Anderson (2007)

While the small island states have by far the largest share of land in these zones, the shares of population in these zones are not exceptional. This is in part because some of the most populous small island states have comparatively little settlement in the low elevation areas. It is also because small island states do not have large rivers, creating flat and fertile deltas where populations would otherwise locate.

Regional averages hide considerable national variation. The 10 countries with the most people living in low elevation coastal zones (figure 2) together account for about 463 million people, or about 73 per cent of the total population living in the zone globally. Most of these countries have big populations and contain large and densely populated delta areas, many of which are also susceptible to subsidence and already have large populations at risk of storm surges.

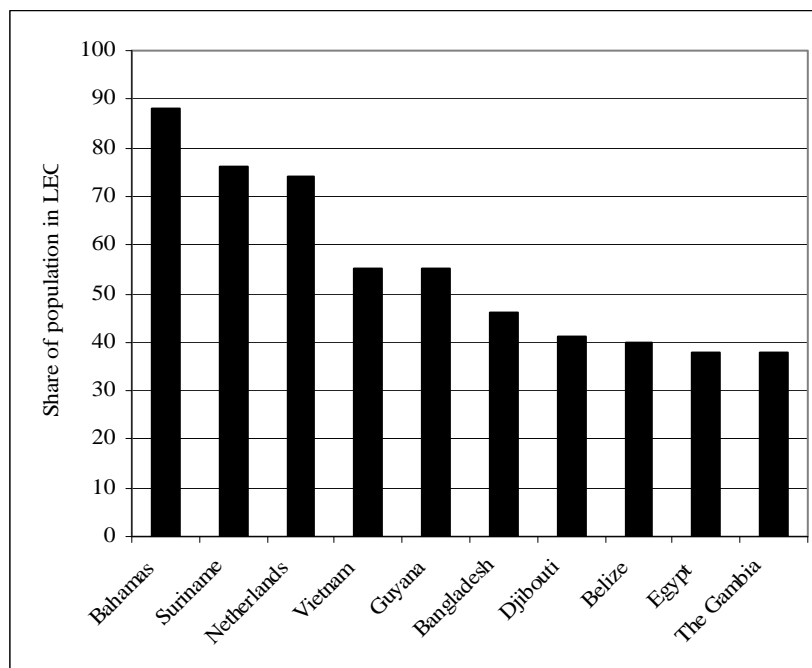
Figure 2. Ten countries with the largest populations in the low elevation coastal zones



Source: McGranahan, Balk and Anderson (2007).

The countries with the highest population shares in the zone (excluding those with total populations of less than 100,000 or land areas less than 100 square kilometres) are shown in figure 3. Three of these countries, Viet Nam, Bangladesh and Egypt, are also among the countries with the largest overall populations in the zone. Only one of them is a small island State—although there would have been several more had the very small countries with populations below 100,000 been included in this figure. Even more so than the countries with large populations in the low elevation coastal zones, those with high percentages of their population in these zones are overwhelmingly deltaic.

Figure 3. Ten countries with the highest population shares in the low elevation coastal zones



Source: McGranahan, Balk and Anderson (2007).

In the world as a whole, but most notably in Asia, not only are urban populations more likely to be in the low elevation coastal zones than rural populations, but larger urban settlements are more likely to overlap with these zones than smaller urban settlements. While only 13 per cent of urban settlements with populations under 100,000 overlap with low elevations coastal zones, 65 per cent among cities of five million or more do. Seven of the 10 largest cities identified in 2005 by the United Nations (Tokyo, New York, Bombay, Shanghai, Kolkata, Jakarta and Buenos Aires) extend into the zone. Indeed, more than 55 million people in these cities and their contiguous urban areas live in low elevation coastal zones.

Asia and Africa—the continents that will be home to the bulk of future urbanization—display different patterns of population distribution. Asia has 91 cities of more than one million persons within the low elevation coastal zones. China alone has 26 cities with over one million persons in these zones and Japan and Indonesia have 11 cities each. Despite this, most of the urban population in the zone lives in cities of 500,000 residents or less. In Japan, 78 per cent of urban dwellers in low elevation coastal zones live in these smaller cities, while in China, 91 per cent of urban dwellers in these zones do (the city-state of Hong Kong special administrative region (SAR) of China, is an exception to this pattern). In Africa, as in Asia, most of the urban population in low elevation coastal zones are found in cities of 500,000 or less inhabitants. Africa has 22 cities of more than one million persons in these zones. Although Egypt alone has 11 cities with over 500,000 persons, 79 per cent of urban dwellers in these zones are in smaller centres. Similarly, South Africa, Algeria, Libya and Morocco each have 3 cities with over 500,000 persons, but the majority of urban dwellers—from 73 per cent in Libya to 81 percent in Morocco—live in smaller urban centres.

Table 2 shows the top 10 countries in terms of the urban population residing within the low elevation coastal zones in Africa and Asia. Asia has seven countries where the urban population residing within low elevation coastal zones is greater than 10 million persons; Africa has one (Egypt). In both

regions, these top-10 lists include the region's most populous country as well as its most urban country (in terms of urban residents). In Asia, total population, urban population and urban population in low elevation coastal zones conform closely. In Africa, the pattern is much more mixed. The list of countries with the largest urban population in these zones , apart from Egypt and Nigeria, includes some countries with relatively small total population (Libya, Benin, Tunisia and Senegal) as well as countries that are not particularly urban (for instance, Benin and Libya).

TABLE 2 – TOP TEN COUNTRIES BY NUMBER OF URBAN PERSONS IN THE LOW ELEVATION COASTAL ZONES, 2000

Panel 1: Africa						
Top Ten	Country	Population rank within continent	Urban population rank within continent	Total population (thousands)	Urban population in low elevation coastal zones (thousands)	Share of total population that is urban and in low elevation coastal zones (%)
1	Egypt	3	1	67 285	11 444	17.0
2	Nigeria	1	2	117 606	4 927	4.2
3	Senegal	24	16	10 343	2 400	23.2
4	Morocco (includes Western Sahara)	10	5	29 530	1 457	4.9
5	Tunisia	25	13	9 563	1 191	12.5
6	Benin	29	24	7 197	1 129	15.7
7	Mozambique	13	15	17 910	1 118	6.2
8	Ivory Coast	14	14	16 735	942	5.6
9	Algeria	9	4	30 462	727	2.4
10	Libyan Arab Jamahiriya	33	19	5 306	726	13.7
	Total urban population in low elevation coastal zones				32 390	
	Total urban population				282 143	
Panel 2: Asia						
Top Ten	Country	Population rank within continent	Urban population rank within continent	Total population (thousands)	Urban population in low elevation coastal zones (thousands)	Share of total population that is urban and in low elevation coastal zones (%)
1	China	1	1	1 256 446	101 241	8.1
2	India	3	2	1 021 084	38 256	3.7
3	Japan	7	3	127 180	27 521	21.6
4	Indonesia	2	4	209 139	22 135	10.6
5	Bangladesh	5	9	128 916	13 063	10.1
6	Viet Nam	4	13	78 666	12 613	16.0
7	Thailand	10	12	61 410	10 571	17.2
8	Philippines	6	10	75 290	6 808	9.0
9	Myanmar	8	18	47 724	4 280	9.0
10	Taiwan	9	11	21 638	3 898	18.0
	Total urban population in low elevation coastal zones				262 779	
	Total urban population				1 532 853	

Source: Author's calculations based on GRUMP (Ciesin and others, 2004) and Isciences (2003)

The global picture is no less striking. Of the 183 countries with people living in the zone, 130 (or about 75 per cent) have their largest urban area extending into the zone. The world's large cities—those with more than five million residents—have, on average, one-fifth of their population and one-sixth of their land area within the zone. On the one hand, these proportions suggest that the urban population is at greater risk than the urban land; and on the other hand, they may suggest that for climate adaptation, migrating or resettling within existing cities but outside of the zone is an option for the population living in these zones.

Continued urbanization will probably draw still greater populations and population shares into low elevation coastal zones. In China, where export-driven economic growth has been associated with very rapid migration toward the coast, national population growth in 1990-2000 was approximately one per cent, while growth in low elevation coastal zones was 1.9 per cent and urban populations in the zone grew by 3.4 per cent. Even in Bangladesh, where urbanization is not so clearly a driver of economic development, movements towards the coastal zone are evident. For example, the country's total population growth rate is 1.2 per cent, while the growth rate in its low elevation coastal zones is 2.1 per cent and growth in the urban population living within these zones is 2.8 per cent (McGranahan and others, 2007).

C. IMPLICATIONS

The above analysis shows that the pattern of urban settlements in low elevation coastal zones is remarkably varied. Deltas clearly stand out as one common factor that many of these regions share (McGranahan and others, 2007), yet whether they alone can act as a unifying agent for policy directives in small and large cities alike is not clear. Governance structures are not oriented towards physiographic entities like deltas and regions, yet climate change may make regional alliances of this sort a necessity.

Looking to the future, the responses to the growing risks brought on by climate change in coastal settlements will need to include climate mitigation, human migration and modification (including adaptation)—all of which have a long lead-time. Cities tend to have short-term planning horizons. Though some cities are actively engaged in regional planning and some have sustainability plans that are medium-term in nature, such plans are not the norm, especially in poorer countries of Africa and Asia. Equity issues will also require attention, particularly because low-income groups often settle along the flood plains and are most at risk. At the same time, these same groups are most at risk from hastily constructed government policies.

D. DEMOGRAPHIC TOOLS AND METHODS

Urbanization and climate change are unavoidable features of the future, yet our ability to predict effectively future urban population growth—and locational implications such as those associated with climate change—is hampered both by methodological and data constraints. Thus, this final section makes recommendations on some of the necessary data and tools to improve future urban population estimates.

Urban areas are spatially delineated. Spatial data, therefore, would be extremely valuable to understanding future urban change. To be most useful, these data should be spatially explicit at the city-level (so that it is possible to determine how cities expand and contract) and within cities (so that it is possible to determine compositional differences between neighbourhoods). In the future, more of the urban world will be faced with issues that require a spatial framework. Three broad areas of inquiry are identified below.

To understand *where* cities are growing, and more generally, to consider urbanization in an environmental context, a spatial framework is necessary. For example, it is impossible to understand the likely implications of growth for urban areas that are situated near coasts or in a dryland vis-à-vis climate change, if one does not know where cities are located and how they are changing in spatial and demographic terms. There is ample relevant, spatial geophysical data (for instance, on rainfall, temperature, climate scenarios, ecosystems, hydrology and elevation) that could be accessed with a spatial framework, so much of the onus to foster this integration is on the demographic side—to render demographic data on cities in a spatial framework. At a minimum, estimates of total current and projected future population of cities is vital. Preferably, data that describe the age-structure, fertility, mortality rates, as well as other related socio-economic variables of cities would be an important addition. These data need to be specified by city or for sub-city units, not simply tallied for all urban areas within a country.

To understand *how* cities grow—horizontally or vertically—and by which causes—natural increase, *migration* and *administrative reclassification*—requires a systematic spatial view. Though case studies and some evidence (Chen and others, 1998) have been offered on these questions in the past, these issues cannot be fully understood in the absence of analysis of spatially coded demographic data. Towards this end, it is not only important that a system of population estimates associated with urban boundaries be established (such as those from the GRUMP project) but an understanding of how they nest within smallest available administrative boundaries with their associated population estimates (Champion and Hugo, 2004). To be most valuable to planners, these data should be collected, or at least estimated, more than once per decade.

Finally, recent evidence clearly finds that level of urbanization does not affect the rate of economic growth (Bloom and others, 2008), yet it also appreciates that many demographic and economic processes—migration, trade, and growth itself—implicitly occur along some sort of gradient of urbanization. One small and understudied part of the urban transformation is the relationship among cities of different sizes and the role of small and medium-sized cities in general (Montgomery, 2008). It is clear that the primate-city model of yesterday is now an outmoded means of understanding urbanization. Yet, whether the demographic and economic growth of the present and the future will occur by the transformation of already large cities into mega-urban regions, or by improved social and economic network of small and medium-sized cities, or any of a number of possibilities, is an open-ended question. Without embracing a spatial framework, this question will remain unanswered. Yet the answer to this question is closely linked to future economic development and sustainability throughout the world.

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SOCIO-ECOLOGICAL SYSTEMS AND URBAN ENVIRONMENTAL TRANSITIONS IN THE ASIA PACIFIC REGION

Peter J. Marcotullio*

A. INTRODUCTION

The main objective is to show that the urban socio-ecological transitions in countries of the Asia-Pacific region are significantly different from those previously experienced by the now developed world at similar levels of income. The differences are identified by comparing the conditions between those countries that developed before the current period of growth associated with globalization (prior to 1950) with those that are currently developing. This paper brings together two sets of literature, one on socio-ecological systems and the other on urban environmental transitions, in an attempt to shed light on the different and unique conditions of contemporary urban development in the Asia-Pacific region¹. Combining the literatures adds further insights into each.

The paper adds to the literature on urban environmental challenges by starting with a conceptualization of cities as socio-ecological systems (see for example, Young, and others, 2006). Such an approach takes into account that cities are social as well as biophysical sub-systems that interact at various geographical levels. Early studies of the urban environment were largely concentrated on the impacts of human activities at the urban scale on the environment (see for example, Gilbert, 1989). Urban ecosystem analysis, however, examines mutual interactions between social and economic activities within urban areas and the natural resources they depend on at multiple scales (McGranahan and others, 2005). There is also a growing literature from the socio-ecological perspective on the unintended consequences of various flows in and out of urban centers (biological invasive species, and unaccounted for nutrients for example) (Grote and others, 2005; Galloway and others, 2007). The literature on urban socio-ecological systems is receiving significant attention by policy makers. The results of a recent conference entitled “Urban Biodiversity and Design, Implementing the Convention on Biological Diversity in Towns and Cities” held in Erfurt, Germany in 2008, for example, were included for consideration in the policy dialogue during the 2008 Conference on Biological Diversity’s Conference of the Parties that resulted in a significant political outcome.²

However, there are few comparative studies of urban ecosystems during the course of the development process. Typically, ecologists have focused on individual cities and socio-ecological relationships for a specific time period. Comparative studies of current and past development conditions are lacking.

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¹ The Asia-Pacific region includes the economies of China, Hong Kong special administrative region of China, DPR Korea, Japan, Mongolia, Republic of Korea, Brunei Darussalam, Cambodia, East Timor, Indonesia, Lao’s People Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Taiwan province of China and Viet Nam.

² The Conference on *Urban Biodiversity and Design, Implementing the Convention on Biological Diversity in Towns and Cities*, in Erfurt, Germany on 21-24 May 2008 produced a declaration “Urbio 2008,” that was the basis, for the first time, of a decision on cities and biodiversity (decision IX/28) made by the representing 191 Parties at the 2008 CBD COP.

The urban environmental transition literature, specifically examines how urban environmental conditions have changed over time (McGranahan and others, 2001). Studies in this area have combined literature on environmental hazards and environmental degradation with development studies.

Urban environmental transition theory suggests that the interactions between different environmental conditions changes with the growth in income (McGranahan and Songsore, 1994; Satterthwaite, 1997). As such, it provides a framework to compare the experience of the developed world with that of the current rapidly developing world. Another important set of studies compare the environment and development experience of cities in the developed and developing world (see, for example, Marcotullio, 2005). This literature outlines the differences in the process of city growth in the developed and developing world.

However, the urban environmental transition literature places a strong focus on environmental hazards—those environmental conditions related to human health, particularly at the local scale (Smith, 1990; Smith and Lee, 1993; McGranahan and Songsore, 1994), including the infrastructure that directly affects human well-being, such as water supply, drainage, sewerage, etc (Hardoy and others, 2001). Local or even regional ecological conditions such as soil or the hydrological conditions within cities, have typically not been examined in detail (for an exception, see McGranahan and others, 2005).

Examining the ecological and environmental changes that occur during the development process—the way in which human systems have impacted ecological systems and how these changes affect urban residents at different geographic scales and over different historical periods—reveals that : 1) contemporary human environmental dynamics differ from those of the past in that environmental challenges are experienced sooner in the developmental process (at lower levels of income), change faster over time and are occurring in a more simultaneous fashion; 2) despite the differences in the scale of urbanization, some environmental impacts of human activities, particularly those experienced at the regional and global scales, are *lower* on a per capita basis than in the past; and 3) local consumption of materials and ecological deterioration are more intensive and their impacts are greater than they were in the past in the developed world. These findings have direct policy implications that are elaborated in the text.

The next section discusses socio-ecological systems and how they provide a better understanding of contemporary urban ecological conditions. Section three reviews urban environmental transition theories and section four puts forth a framework within which these two literatures can be combined. Section five presents empirical evidence based upon the framework presented, section six discusses why the observed patterns have emerged and section seven identifies some implications of the findings and presents broad recommendations. The final section summarizes the main points and concludes the paper.

B. SOCIO-ECOLOGICAL SYSTEMS

Recent studies on ecological systems suggest that there is significant human intervention in bio-geophysical processes at all levels, including at the global level, resulting in both degradation and actual harm to human well-being (Millennium Ecosystem Assessment, 2005; Bernstein and others, 2007; UNEP, 2007). In other words, human activity is a major driving force in environmental change at all scales.

Recent research has been conducted to understand the growing complexity of human interaction with the environment (Holling, 2001; Kinzig, 2001). Instrumental in these efforts is

the notion that human activities are dependent upon and affect the natural ecosystem processes, structure and functions. Considering the human or social sphere together with the environmental or ecological sphere is fundamental to socio-ecological systems research or human environmental systems theory (Berkes and Folke, 1998; Turner and others, 2003; Liu and others, 2007; Young and others, 2006).

Socio-ecological systems research emphasizes the interactions and feedbacks between the human and ecological spheres across different scales. A difficult challenge, however, has been the integration of socio-economic and biophysical variables. One promising approach has been to use the concept of “ecosystem services,” defined as those goods and services that ecosystems provide for human well-being (Daily, 1997; Millennium Ecosystem Assessment, 2005). They include a wide variety of services beyond food, water and fiber, and encompass, for example, environmental regulatory functions, and even aesthetic and spiritual values. Researchers using this approach have examined how humans have impacted the state of ecosystems and the way they function, how ecosystems have reacted to these changes, and the ability of ecosystems to provide the services important for human well-being.

At the urban scale, this perspective is useful for the following three reasons. First, it broadens the study of urban ecology at the local scale and of the human impact on the environment. Previous studies on urban ecology examined the natural environment or ecosystems within cities and how these had been altered by human activities (Gill and Bonnett, 1973; Gilbert, 1989). The first extensive set of urban ecology studies examined changes in urban hydrology as well as changes in land use and land cover in urban areas (UNESCO, 1977; Ward, 1981). These studies showed that urbanization-related activities such as removing trees and vegetation, constructing houses, streets and culverts, paving large sections of land, channeling waterways and constructing storm drains have dramatic effects on local hydrology. Typically, the water cycle in urban areas produces lower general evapo-transpiration, infiltration and interception of water, lower groundwater tables, increased stream sedimentation and storm flows, and decreased base river flows. It also leads to earlier and higher runoff concentration peaks, with increased volume of runoff relieved locally, but aggravated for those downstream (Dunne and Leopold, 1978; Rodgers, 1994). Urbanization also impacts the quality of water and fluvial geomorphology (Graf, 1975; Klien, 1979; Ellis, 1999).

Urban ecological studies of soils also identify the differences between urban and non-urban soils in terms of bulk density, boundary layers, pH, water drainage, crusting and water repellency and temperature. Typically, soils in urban areas are more compacted, have less distinct boundary layers, higher pH, and lower water drainage. They also have water repellent crusts and higher temperatures (Craul, 1985; Craul, 1992; Wheeler, 1999; Marcotullio and others, 2008). Atmospheric scientists, such as Landsberg (1981), suggest that urban climate conditions include lower radiation, more cloudiness, higher precipitation, higher temperatures and more particulates, gaseous admixtures and other contaminants than non-urban climates. Finally, a recent review of over 150 studies on the association of animal and plant richness and urbanization suggests that, in central urban core areas, species richness tends to be reduced, but in areas of “moderate levels of urbanization,” (i.e., suburban areas), there is significant variation among groups (McKinney, 2008). Most of the studies of plant species variation indicate that suburban areas have a greater variety of species than urban and non-urbanized areas. On the other hand, a few studies suggest the same trend for invertebrates and some other studies of non-avian vertebrates show increasing species richness with moderate urbanization. All these studies have identified dramatic differences between the ecosystem dynamics in urban areas and those in non-urban areas.

While interesting, these studies concentrate primarily on the extent of change in urban natural environments, and they do not shed light on how changes in the natural environment, in turn, affect human well-being. Recent socio-ecological system studies use the concept of “ecosystem services” to examine how changes in the local, regional and global environment impact people in cities and vice versa (McGranahan and others, 2005). For example, Bolund and Hunhammar (1999), Miller and Hobbs (2002), and Miller (2005), suggest that biodiversity and natural resources within urban areas play a role that is as important as that of air and water purification, that they provide amenity values such as aesthetics, enjoyment and recreation and are an important part of environmental education and conservation. Not only do these studies identify changes in urban environments they also highlight the value of these changes for urban residents.

Second, the socio-ecological system perspective examines linkages among sub-systems from the local to the global levels (Gallopín, 1991; Gallopín, 2006). Major research efforts are now in place to study the global socio-ecological system, or Earth system (Schellnhuber, 1998; Kump and others, 2004).³ Many studies have also focused on the relationship among environmental impacts, economic activity, technology and regulations at the national scale (Grossman and Krueger, 1992).

More recent socio-ecological system studies emphasize that urban activities can impact the regional and global environment as well. Local activities affect a number of environmental issues at different scales (Marcotullio and McGranahan, 2007). Conversely, global changes in environmental conditions affect cities. If climate change produces sea level rises, the majority of those affected will be urban dwellers (McGranahan and others, 2007). A study of seafood consumption in Tokyo demonstrates that consumption patterns have responded to changes in the levels of marine services, as residents changed the types and amounts of seafood consumed over time. Despite the great wealth of this city, these patterns suggest that city residents are eating down the food chain as high-trophic level seafood (large predatory fish such as tuna) has become less abundant (Gadda and Marcotullio, 2006). Another cross-scale study focused on nutrient flows into Bangkok from trade and other local sources. It found that food consumption, fertilizer use and atmospheric deposition are largely sourced from outside the city and that only a small fraction of nutrients flowing into the city are recovered (approximately 7 per cent of nitrogen), and of the nitrogen lost, 97 per cent ends up emitted to a larger scale (Faerge and others, 2001). In a historical analysis, Schulz (2007), examines the socio-ecological system of Singapore showing important changes in the level and composition of consumption in the city as it globalized, and changed its economic structure, and the levels of imports and exports.

Moreover, studies of cross-scale impacts go beyond direct relationships between human actions and the environment. For example, trade in food indirectly affects the hydrological cycle and water availability as the food moving across border incorporates “virtual water” i.e., the volume of water used to produce a given commodity (Hoekstra and Hung, 2005). There is also a growing literature on the indirect impacts of trade, such as the flows of unintended materials (biological invasive species, for example) and on how trade impacts nutrient cycles (Grote and others, 2005; Galloway and others, 2007).

Many across-scale studies have arguably been influenced by urban ecological footprint and material flow accounting. The urban ecological footprint, for example, identifies the total amount of resources a city or nation consumes and the wastes a city emits. It includes all resources consumed, both those internal to the economy as well as those from “distant

³ See <http://www.essp.org/>.

elsewheres” and it turns these figures into a single indicator of ecological footprint (in hectares per capita) (Rees, 1992; Wackernagel and Rees, 1996; Wackernagel and others, 2002; Wackernagel and others, 2006). Cities in the United States and the United Kingdom require an area 3 to 42 times the populated surface area to produce the necessary ecosystem services (Best Foot Forward, 2002; Redefining Progress, 2004, 2005). Those that have examined the footprint of Hong Kong Special Administrative Region (SAR) of China, suggest that the area needed to produce the ecosystem services and absorb waste is more than 2,000 times the size of the city (Warren-Rhodes and Koenig, 2001). Moreover, researchers found that approximately 30 per cent of resources (excluding energy) are obtained from China (mainly Guangdong) and 60 per cent from other parts of the world.

Ecological footprint analysis is built upon studies of bulk and specific material flows.⁴ For example, studies of globally traded flows in ecosystem services include livestock products and implicitly their impact on cycles of water, nutrients and land. Quantifying the movement of these resources demonstrates the tremendous impact that humans, and particularly those living in cities, have on the environment. A recent study of the major exporters and importers of pork and chicken suggest that Japan’s imports of these commodities embodies the equivalent of 50 per cent of its arable land and that half of the nitrogen used to produce them is lost in the United States. Taken as a whole, the Asia-Pacific region itself has experienced a 380 per cent increase in reactive nitrogen over the last 40 years (Zheng and others, 2002).

In addition to studies of consumption and material flows at aggregate levels, other analysts have focused on the multi-scaled dynamics of human disease ecology. Some have argued that the flows of certain diseases have increased in speed and volume with the international economic connections amongst cities. While the international transmission of disease is not new, air travel and international contacts have accelerated its potential speed. For example, approximately 5 months after the February 2003 initial reports from East Asia of the appearance of an atypical highly contagious and life-threatening respiratory disease, called severe acute respiratory syndrome (SARS), more than 8,000 cases had been reported in close to 30 countries (World Bank, 2007).

Third, when taking a long-term historical perspective, the socio-ecological system perspective provides new insights into the constraints and advantages of current development models over those of the past. An important insight from these studies is the evident change in dynamics between the human and the ecological spheres over time. Changes in environmental conditions have been noted throughout history and their regional impacts have been identified as resulting from human activities thousands of years ago. For example, McNeill (2000) suggests that emissions from Roman smelting could be found in Swedish bogs and Greenland ice. Indeed, emissions of copper surged twice before the industrial revolution, once after the introduction of coins in the ancient Mediterranean and during the Song Dynasty from 960-1279 AD (see also Hong and others, 1996; Nriagu, 1996). Ruddiman (2003) goes even further back in history to argue that the “long summer,” or the mild climatic conditions that have been enjoyed over the past 10,000 years, allowed for the development and distribution of our species and was partly instigated by human activities, including carbon and methane releases from deforestation and

⁴ The material flows analysis has a long history. While the methods of material flows were largely outlined in the 1960s, it wasn’t until the 1990s that the approach became one of the most important techniques to study the human-nature interactions (Fischer-Kowalski, and W. Huttler, 1998). "Society's metabolism, the intellectual history of materials flow analysis, Part II, 1970-1998." *Journal of Industrial Ecology*, vol. 2, No. 4, pp. 107-136.

irrigated rice cultivation. These activities helped to prevent glaciations, initiated anthropogenic global warming and allowed for the advance of humans (see also Flannery, 2005).

But while the changing relationships among components of the socio-ecological systems can be identified in early human history, the most dramatic changes began with the industrial revolution, as the major global linkages tightened and intensified. For example, human activities worldwide from 1890 to 1990 produced a fortyfold increase in industrial output, a fourteenfold increase in world production, a fourfold increase in the population and a thirteenfold increase in the urban population of the world. These changes have been associated with, among other impacts, a thirteenfold increase in energy use, a doubling of land under cultivation, a fivefold increase in irrigated area, a thirty-five-fold increase in marine fish catch, a ninefold increase in water use and a decrease in the blue whale population by 99 per cent (McNeill, 2000). Recent assessments suggest the greater part of these changes have occurred over the last 20 to 50 years (Millennium Ecosystem Assessment 2005; UNEP, 2007). The Millennium Ecosystem Assessment (2005) stated that over the last 50 years human activities have impacted the ecosystem more rapidly and extensively than in any other period in human history. A recent United Nations Environment Programme (UNEP) Global Environmental Outlook report (2007) also suggests that over the last 20 years there has been an unprecedented change in land use, resulting in land degradation, climate change and biodiversity loss, which threatens habitat, economy and society.

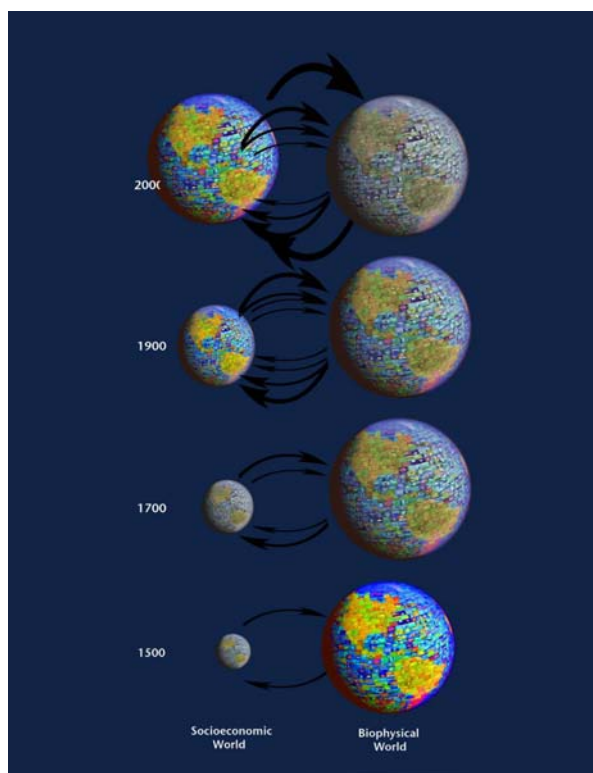
The linkages between the social and ecological spheres are strengthening, and the growth of the social sphere is increasingly impacting the management of the biophysical sphere. An increasing number of ecosystem services have been appropriated and are managed by humans. For example, with the expansion of agriculture, the reliance on pollinators to help spread genetic material among plants has increased, leading to a loss of biodiversity and the need to increasingly manage pollinator activities. A case in point is the trade in honeybees between the United States and Australia, which resulted in the sudden disappearance of honeybees in the United States through a phenomenon called colony collapse disorder (CCD). The origin of the disorder is a suspected pathogen found in Australian bees, but not affecting them. The introduction of the pathogen to United States bees has infiltrated approximately 23 per cent of United States beekeeping operations and decimated up to 90 per cent of their hives (Skokstad, 2007).

Figure 1 is a representation of these shifting conditions. The link between the two spheres (the socioeconomic and the biophysical spheres) has grown in number and intensity over time. The social sphere has grown in size⁵ while the biophysical sphere, that has experience significant changes in fundamental characteristics (i.e., climate and weather variations, biodiversity loss, land degradation, etc), is relatively smaller and dimmer.

These changes have differences in the development patterns in local, regional and planetary socio-ecological systems, and have affected the opportunities and constraints that countries and cities face as they develop. The relationship of New York City to its hinterland and environmental resource base at the turn of the twentieth century is fundamentally different from that of Shanghai to its hinterland and resource base at the turn of the twenty-first century.

⁵ According to Maddison (2001), GDP purchasing power parity (PPP) increased from less than \$2 trillion in 1990 to over \$36 trillion PPP in 2000, and population increased from an estimated 1.2 billion in 1990 to over 6 billion in 2000. Data from A. Maddison, (2001). *The World Economy, A Millennial Perspective*. Paris, OECD.

Figure 1: Changes in the global socio-ecological system



As a result of these trends, over the past 20 to 50 years in particular, the social sphere has grown at the expense of the biophysical sphere, which is becoming systemically more unstable (vulnerable to abrupt significant change), less productive (more degraded) and less diverse in biological content (Millennium Ecosystem Assessment, 2005; Bernstein and others, 2007; UNEP, 2007).

C. URBAN ENVIRONMENTAL TRANSITIONS

The urban environmental transition theory was developed over the past two decades (McGranahan and others, 2001). It states that as cities grow in affluence, urban environmental burdens tend to shift from local health threats with immediate impacts to global ecosystem changes with delayed impacts. The model is based on the notion that the type and scale of the environmental impact increases with wealth. Accordingly, as a poor city moves beyond the “brown” agenda, which prioritizes concerns such as inadequate water supply and sanitation, indoor air quality, drainage and solid waste disposal, the environmental impacts of urban activities shift from the household and neighborhood levels to the regional level. At the metropolitan scale, the dominant issues include water and air pollution, sometimes called the “gray agenda” (Marcotullio and Lee, 2003). As the wealth of cities continue to grow, urban environmental burdens shift from the metropolitan scale to the regional and global scale. These are associated with the “green” agenda, and include acid rain, water scarcity, greenhouse gas and ozone depleting substance emissions. The theory provides a powerful tool for understanding the shifting environmental conditions during urban development.

Historical urban research that associates urban growth and environmental impacts suggests that in the past, urban environmental burdens were addressed by dispersing the

associated harms to greater scales. Urban environmental historians of the United States have also noticed the change in environmental burdens over time. Melosi (2000) notes how environmental challenges associated with water supply, sanitation and solid waste management have undergone successive changes over time and have spread to increasingly wider geographical spaces. Tarr (1996) suggests that urban environmental history can be fundamentally characterized as the search for larger and larger sinks in which to pour wastes. Both of these historians have identified changes in the type, geographic and temporal scales of environmental burdens comparable to those embodied in urban environmental transition theory.

Urban environmental transition theory has been applied to different contexts, including the rapidly developing economies of Asia (Webster, 1995; Bai and Imura, 2000; Bai, 2003). These studies have described the differences between cities of various income levels, or analyzed the speed of the transitions. Bai and Imura (2000) for example, insist that environmental transitions have occurred in sequence in Asian cities, from traditional to industrial to modern environmental challenges, albeit in a faster manner than previously experienced.

These studies, however, lack the appropriate data at the urban level. They have not examined the ecological services nor compared the development patterns between Asian economies and others in a systematic way. In contrast, this study attempts to provide urban level analyses and to compare trends on ecological conditions and their impacts on human well-being across space and time.

D. ENVIRONMENTAL TRANSITIONS IN URBAN SOCIO-ECOLOGICAL SYSTEMS

In order to assess how socio-ecological systems change with development, this paper uses the urban environmental transition framework and focuses on the direct and indirect human-environment relationships at different scales.

The shifts in the socio-ecological relationships portrayed in figure 1 embody effects over time and across space. In particular, they reflect technological advances that are increasing world interconnectedness and are altering the way in which human activities unfold across time and space. These are referred to in this paper as time- and space-related effects.

Time-related effects are changes in development patterns that result from changing the speed and efficiency of socio-economic activities. Time-related effects draw places closer together and link cities across the globe, leading to convergence among urban areas. For example, time-related effects allow the “world to grow smaller” as it is now possible to travel from New York City to Singapore in 18 hours, which would have taken several days fifty years ago. As the world becomes a “global village” (McLuhan, 1962) through better, faster and more convenient transportation and communication, cities begin to look more alike. They build similar types of infrastructure (skyscrapers, malls in international airports, high speed train lines, etc.) and house similar retail stores (Wal-Mart, Tesco, Kinokuniya Bookstore, Sogo, Carrefour, Metro AG), banks (Citibank, HSBC), and fast food restaurants (McDonald’s, Starbucks Coffee, MOS Burger, Pizza Hut). Moreover, there are, arguably, increasingly similar biota within cities across the world (sparrows, rock doves, rats, mice, starlings, and ornamental plants) (McKinney, 2006). Time-related effects help to homogenize cities.

Space-related effects create diversity and complexity in cities on the other hand. Cities are becoming more alike in some respects, but they are also more diverse than they were in the past (Massey, 1996; Amin and Graham, 1999). New York City has always been an ethnically diverse city, but it is even more diverse now than it was a century ago. Also, the technologies

used in the cities of today include those of the past, the present and those to be used in other cities in the future. For example, cities of Southeast Asia combine a variety of transport modes, which include the traditional animal and human powered ones alongside the latest model motor vehicles. Shanghai boasts a Maglev train. Moreover, within many cities of the region, new hotels or high rise residential towers with the highest and most advanced conveniences can be found located not too far from village-type housing without even the most modest bathroom.

A large number of studies of time-space effects in geography and sociology use three concepts to describe how these effects relate to human activity: *convergence*, *distanciation* and *compression of time and space*. *Convergence* refers to the apparent reduction of the time it takes to travel between cities or other human settlements, as they are linked by better transportation (Janelle, 1968; Janelle, 1969). The velocity at which settlements are “moving together” with better transport has been called the time-space convergence rate. This notion is similar to that of a ‘shrinking world’.

Distanciation refers to the stretching of social systems across space and time (Giddens, 1990). In the past, people interacted mostly through face to face communication. With advanced communication technologies, people can interact both face to face and remotely. This stretching of social linkages across space has been called the ‘distanciating’ of social relationships. Thus, during the contemporary period, it is not necessary for people to be physically present at a particular location to interact and to be important social or political actors.

Compression refers to the same phenomenon as convergence, only that it is viewed over space instead of time (Harvey, 1990). The concepts of *convergence* and *distanciation* suggest that technological advancements are the major underlying force for social relations and travel patterns being stretched across space. These notions however, do not provide any explanation of what is at the core of these changes. The *compression* perspective suggests that capitalist development tends to find ways to speed up the circulation of capital so as to reduce the “turnover time of capital” (i.e., the amount of time it takes to convert investment into a profit). As a result, technologies and policies that facilitate faster turnover are favoured and promoted. All these processes are at the core of *time-space compression*. The effect of compression is disruptive to the balance of class power and of social and cultural life, which are integral to the capitalist dynamic.

In addition to the three concepts of time- and space-related change, a fourth one is added, *telescoping*, a descriptive account similar to *convergence* and *distanciation*. *Telescoping* reflects the *earlier* (i.e., at lower levels of income) occurrence, *faster* (over time) rates of change and the *simultaneous* (as sets of challenges) emergence of environmental challenges, as compared to the experiences of the developed world (Smith and Lee, 1993; Marcotullio, 2002; Popkin, 2002; Marcotullio, 2005)

Telescoping specifies how the experiences and conditions in the rapidly developing urban world today are different from those previously experienced by the developed urban world. China’s urbanization, for example, is not simply a quicker version of what the United Kingdom or the United States experienced during the late nineteenth and early twentieth centuries. While China is indeed developing fast, some conditions and challenges are also appearing at lower levels of income and simultaneously, rather than sequentially as they did in the United States and the United Kingdom. This has also translated into different impacts on the socio-ecological conditions within cities. What is occurring in rapidly developing Asia-Pacific region today does not resemble the sequence of events that the developed world experienced in the past. The next section will examine these processes with empirical evidence.

E. ENVIRONMENTAL IMPACTS OF URBAN TRANSITIONS IN THE ASIA-PACIFIC REGION

One way to observe the “earlier, faster and more simultaneous” occurrence of socio-ecological challenges in the Asia-Pacific region is to compare the evolution of particular countries and cities. As mentioned previously, this is often difficult because of data limitations. Except for population data, comparable urban level information is typically unavailable, although evidence of these patterns can be obtained. This section compares available empirical analysis of the development patterns and socio-ecological conditions in various cities and countries of the Asia Pacific region with those of the now developed world.

The data for the analyses were obtained from a variety of sources. The focus is on cities and their socio-ecological conditions and the urbanization process, although data are sometimes aggregated at the national levels. Rather than being comprehensive, the analyses are meant to be indicative⁶.

Most of the comparisons that follow are performed across areas with similar levels of GDP per capita, at purchasing power parity (PPP). The use of GDP per capita however, does not mean to suggest that income is a sufficient indicator of “development.” The main argument presented is that not all aspects of socio-ecological development are similar during the process of economic growth.

The first sub-section of this chapter focuses on the earlier emergence of socio-ecological challenges and ecological change. The second sub-section focuses on the increasingly faster shifts in urban socio-ecological conditions. The third sub-section presents evidence for the shifts in timing and the more simultaneous occurrence of sets of ecological burdens. The fourth sub-section presents an analysis of the intensities of ecological impacts associated with these processes.

1. The earlier emergence of some socio-ecological conditions

This sub-section presents evidence that demonstrates that some socio-ecological conditions are emerging at lower levels of income or urbanization in rapidly developing countries as compared to the now developed world. Four representative phenomena are articulated, including the adoption of advanced telecommunication technology at earlier stages of the development process or at lower income levels, the earlier use of some transportation technologies (and hence their emissions), the earlier occurrence of shifts in energy supplies, and the earlier occurrence of urbanization in general.

Figure 2 presents an analysis of the assumption of Internet access within some developing countries of the Asia-Pacific region compared to that of Japan and the United States. At the far right of the graph, the United States curve demonstrates immediate and strong uptake of the technology once the country reaches a level of per capita income past \$22,000. Interestingly, the other Asia-Pacific countries do so but at lower levels of income. Specifically, Japan and Hong Kong SAR of China, experienced increases in Internet penetration after \$20,000 per capita and

⁶ Descriptions and details are given in previously published articles (Marcotullio and Lee 2003; Marcotullio, Williams and others. 2005; Marcotullio 2007; Marcotullio and Marshall 2007; Marcotullio and Williams 2007; Marcotullio, Braimoh and others. 2008).

Korea's experience occurred after \$12,000 per capita. Malaysia, Thailand and China are following the same patterns, but starting at GDP per capita levels below \$8,000.

Figure 2. Comparison of growth in ICT (Internet) penetration among selected countries

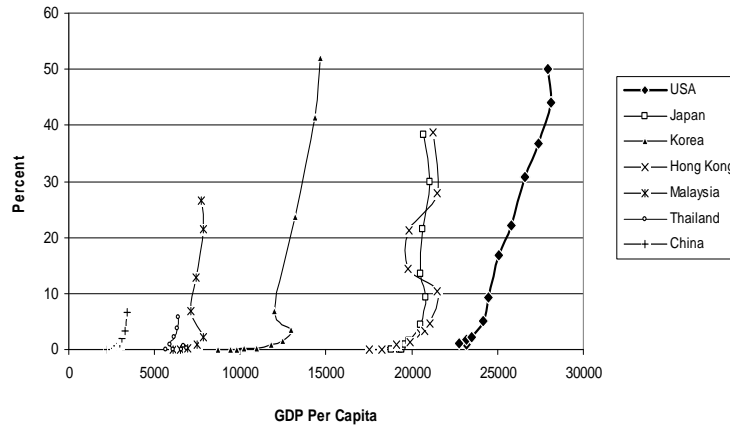


Figure 3 shows transportation-related carbon dioxide (CO₂) emissions by GDP per capita for groups of countries. These data were calculated directly from motor vehicle, truck and airplane fuel consumption. The automobile was developed at the turn of the twentieth century and mass-produced starting around 1908 in the United States. Subsequently, adoption of this technology skyrocketed along with the consumption of petrol and emission of CO₂ from the combustion of the fuel. Trucks and diesel fuels became significant in the mid 1920s. While airplanes were invented earlier, the commercialization of this technology was not apparent before the mid-1930s and only really took off after World War II. What is obvious in this figure is that the emissions of the rapidly developing Asia-Pacific countries (ASEAN-4, the less developed Asian and the Asian Tigers) began at lower levels of income than the United States. For example, the “less developed Asian” category, which includes India, China and Viet Nam, has been producing the same levels of CO₂ emissions at per capita income of \$1,000 that the United States produced when it had a per capita income of \$4,500.

Figure 3. Total transportation CO2 emissions (kg) per capita per GDP per capita

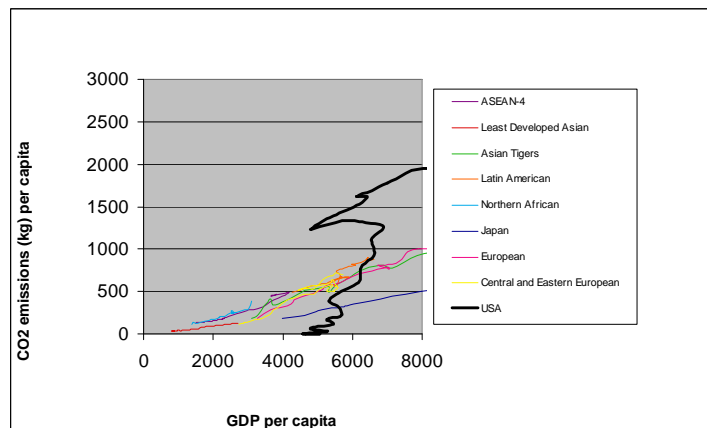
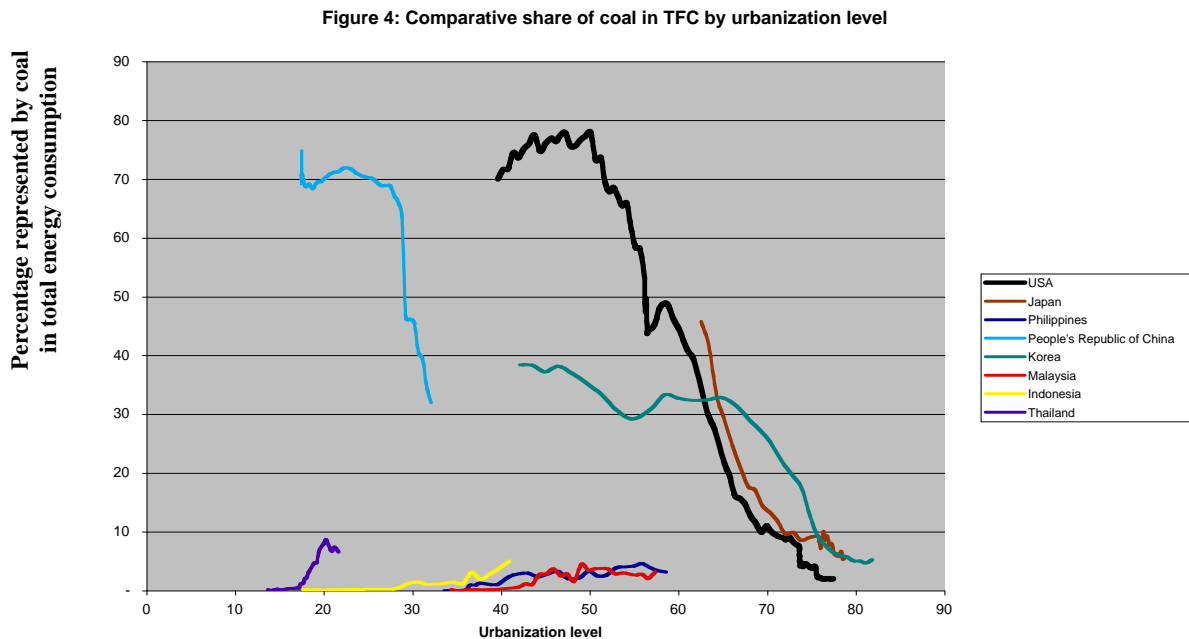
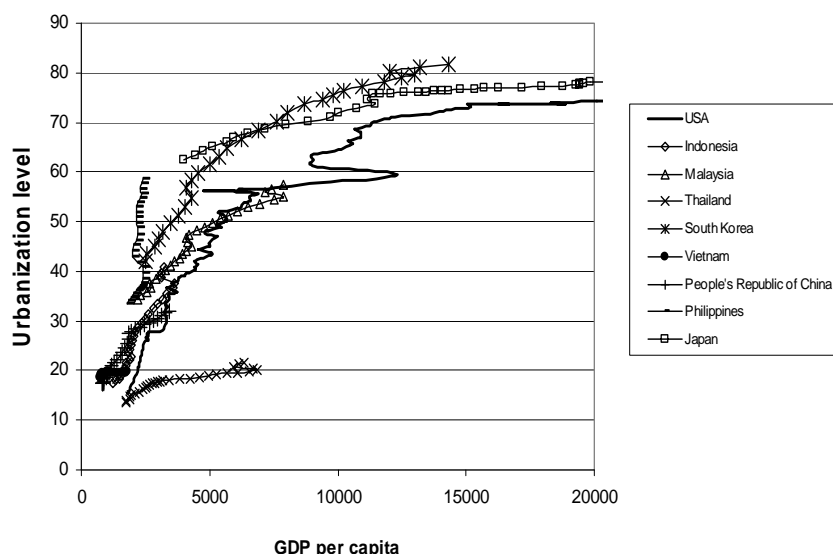


Figure 4 shows the share of coal in total final energy consumption (TFC) by level of urbanization (percentage of the population being urban). In the United States, coal remained the major source of fuel until late into the urbanization process. Coal accounted for approximately 80 per cent of the nation's fuel consumption at a time when 50 per cent of the population lived in cities. Historical accounts of air pollution within cities in the United States attest to this trend, as accounts suggest that smoke was creating an environmental disaster (Stradling, 1999). This pattern was matched closely by East Asian countries such as Japan and Korea, but not by others. Even China, a coal-rich nation, had shifted from coal to other sources of energy at earlier stages of the urbanization process. Despite the description of China's cities as laden with coal smoke (Freese, 2003) the data suggest that the country was switching to other sources of fuel earlier than the United States did during its urbanization process.



Finally, figure 5 compares the levels of urbanization of the United States, Japan and several other Asia-Pacific countries. Of note are the higher urbanization levels of Asian countries at lower levels of income. While this analysis is incomplete and should include the experience of other developed countries within the sample, it suggests that urbanization was occurring at lower levels of income. Interestingly, this is not the case for all Asia-Pacific countries and may not hold with rising income. For example, Thailand's patterns of urbanization are dramatically different from those of its neighbors and from those of the developed world, as Thailand has become wealthier without urbanizing. On the other hand, Japan and Korea have reached higher levels of urbanization than the United States did at given levels of GDP per capita. Finally, Malaysia has urbanized at lower levels of income, but the country's urbanization patterns seem to be converging with those of the United States. The earlier start of the urbanization process in the developing world has been noted by other urbanization specialists as well (Preston, 1979; Williamson, 1988; Bockerhoff, 1999; Bockerhoff, 2000).

Figure 5: Comparative urbanization levels by GDP per capita, USA and selected Asian-Pacific countries



The easier availability of new technologies and their impacts at lower levels of income helps to explain some of the observed shifts in environmental transitions. Many of the advanced technologies are developed in North America, Europe and Japan and are increasingly finding their way around the world and into developing countries, with ensuing opportunities and challenges. The reasons and implications are discussed in the following sections.

2. Comparative speed of change in socio-ecological conditions

To demonstrate the changes in the pace of change in socio-ecological conditions, data are presented on the comparative speed of urbanization, the rates of change in road CO₂ emissions and the rates of change in energy supply in the United States, Japan and other selected countries in the Asia-Pacific region.

Table 1 presents annual percentage change in urbanization rates of countries in the Asia-Pacific region and in the United States. These *rates of change* were calculated at similar income levels, that is, the proportion of the population that is urban is shown for each country as compared to the United States at similar levels of GDP per capita. The results demonstrate that urbanization occurred earlier in the development process of countries of the Asia-Pacific region than in the United States, in all cases except for Thailand.

Table 2 presents a comparison of the rate of change in road CO₂ emissions over time. Various Asia-Pacific countries are compared with a number of developed countries at similar levels of income. Within the Asia-Pacific region, road CO₂ emissions are growing fastest in Hong Kong SAR of China, Malaysia, South Korea and Taiwan Province of China. When compared to the United States, emissions grew faster in South Korea and Malaysia at similar levels of GDP per capita. In all other countries, CO₂ emissions were growing more slowly than in the United States for a given level of income per capita.

TABLE 1. ANNUAL PERCENTAGE CHANGE IN URBANIZATION (PROPORTION OF THE POPULATION LIVING IN URBAN AREAS) IN SELECTED ASIAN COUNTRIES COMPARED TO THE UNITED STATES AT SIMILAR INCOME LEVELS

(1)	Percentage change in the urban proportion (2)	Percentage change in the urban proportion in USA (3)
South Korea	1.46	0.49
China	0.51	0.47
Thailand	0.24	0.51
Malaysia	0.79	0.50
Indonesia	0.94	0.47
Philippines	0.92	0.49
Japan*	0.87	0.47

Source: Calculations by Peter J. Marcotullio

*For this analysis, the Japanese data includes the range 1920-2000. In 1960, the year that the energy data begun, Japan's population was approximately 63 per cent urban.

NOTE: The comparable time periods used for the analysis were based upon similar ranges of income. These ranges vary by country. For the Malaysian example, GDP per capita ranged from \$4,500 to \$7,900 during the period 1988 - 2000. The USA experienced the same income ranges from 1904 to 1940. The GDP per capita figures were taken from Maddison (2001).

TABLE 2. COMPARISON OF CHANGES IN ROAD CO₂ EMISSIONS PER CAPITA PER YEAR IN ASIAN COUNTRIES AND IN THE US OVER COMPARABLE INCOME RANGES

	Change in Asian road CO ₂ emissions per year (kg per capita/year)	Change in developed world economy road CO ₂ emissions per year (kg per capita/year)
	Asian	USA
Hong Kong	52.48	77.64
Japan	41.52	71.93
Malaysia	63.30	57.68
Singapore	28.62	70.85
South Korea	68.90	63.55
Taiwan	52.59	62.64
Thailand	37.87	57.32
	Asian	Australia
Hong Kong	59.90	53.74
Japan	38.55	53.74
Singapore	21.78	50.91
South Korea	52.15	87.61
Taiwan	61.89	72.91
	Asian	France
Hong Kong	48.04	42.92
Japan	39.18	42.92
Singapore	21.43	42.92
South Korea	63.98	62.13
Taiwan	62.83	49.75
	Asian	the Netherlands
Hong Kong	59.90	32.27
Japan	38.55	32.31
Singapore	22.65	32.31
South Korea	52.15	43.47
Taiwan	61.89	33.42
	Asian	Italy
Hong Kong	35.87	40.50

Japan	38.64	40.50
Malaysia	79.49	59.07
Singapore	32.57	40.50
South Korea	69.47	38.82
Taiwan	60.01	40.80
	Asian	Sweden
Hong Kong	48.91	34.29
Japan	38.24	34.29
Singapore	23.97	34.29
South Korea	52.15	60.33
Taiwan	61.89	44.85
	Asian	United Kingdom
Hong Kong	45.05	35.93
Japan	37.58	35.93
Singapore	25.86	35.93
South Korea	52.15	35.77
Taiwan	61.89	39.15

Source: Calculations by Peter J. Marcotullio

NOTE: The comparable time periods used for the analysis were based upon similar ranges of income. These ranges vary by country. For the Malaysian example, GDP per capita ranged from \$4,500 to \$7,900 during the period 1988 - 2000. The USA experienced the same income ranges from 1904 to 1940. The GDP per capita were taken from Maddison (2001).

The growth rates of CO₂ emissions observed in Asian countries were, however, higher than those observed in developed countries other than the United States. In general, Hong Kong SAR of China, Taiwan Province of China and South Korea's road CO₂ emissions were growing at faster rates than those of most developed countries in this sample, at a given level of income per capita. Malaysia's rate was higher than that of Italy and even Japan's growth in road CO₂ emissions surpassed that of the United Kingdom, Sweden and the Netherlands. Only Singapore's growth rates of road CO₂ emissions were consistently lower than those of the developed world.

Table 3 presents the change in total primary energy supply (TPES) in the United States, Japan and other countries in the Asia-Pacific region. What is surprising here is that when compared to the United States, which has typically been an outlier in terms of increases in energy supply and consumption among developed economies, Asian-Pacific countries are experiencing faster increases in their supplies than did the United States over comparable income levels. Given that the road CO₂ emissions grew faster in Korea and Malaysia, the increase in emissions must have been produced by sources other than transportation.

TABLE 3. CHANGES IN TOTAL PRIMARY ENERGY SUPPLY (TPES) OVER SIMILAR INCOME RANGES (KOE/CAPITA/YEAR)

	Change in TPES	USA Change in TPES
South Korea	124.27	43.59
Singapore	187.21	58.55
China	17.12	11.08
Thailand	32.07	33.18
Malaysia	61.24	36.90
Hong Kong	59.45	75.94
Indonesia	15.53	11.28
Philippines	5.10	-5.49
Japan	76.29	57.67

Source: Peter J. Marcotullio and Niels B. Schuls (2007). Comparison of Energy Transitions in the United States and Developing and Industrializing Economies, *World Development*, vol. 35, No. 10, pp. 1650-1683.

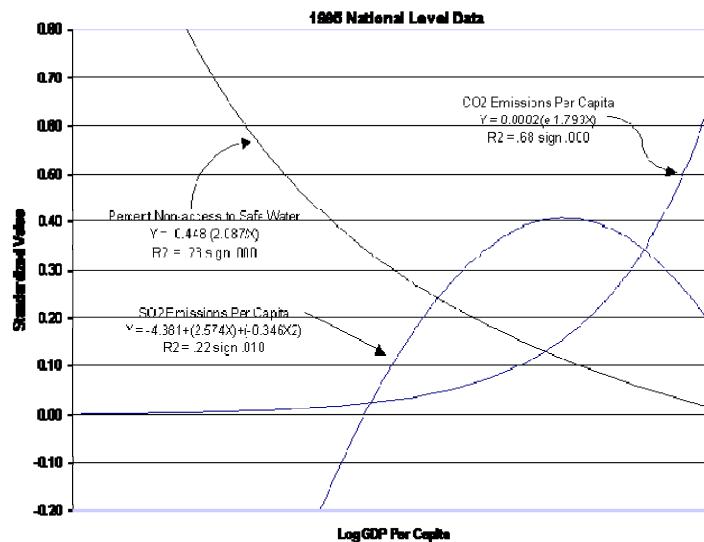
NOTE: The comparable time periods used for the analysis were based upon similar ranges of income. These ranges vary by country. For the Malaysian example, GDP per capita ranged from \$4,500 to \$7,900 during the period 1988 - 2000. The USA experienced the same income ranges from 1904 to 1940. The GDP per capita were sourced from Maddison (2001).

3. Comparative timing of socio-ecological transitions

In comparing development patterns experienced by cities in developed and developing countries, it is observed that socio-ecological change does not take place in a sequential manner any longer in rapidly developing Asian cities; to a large extent, changes are taking place simultaneously.

Some indicators of environmental conditions are shown in figure 6. An analysis of the data for three different types of environmental burdens reveals the specific characteristics of environmental transition scenarios that pertain to Asian cities. The figure shows the relationships between GDP per capita and the percentage lacking access to safe water, sulfur dioxide (SO₂) emissions per capita and CO₂ emissions per capita.

Figure 6. Per capita CO₂ emissions and percentage without access to safe water, by income level (...1995)



The graph illustrates the dynamics of contemporary environmental transitions. The local severity of environmental problems varies inversely with wealth. One variable, non-access to safe water, is used as a proxy for the entire group of variables related to these “brown” conditions (which also include non-access to sanitation, indoor air pollution, drainage, etc). Access increases with wealth as it is arguably the case for the other variables listed.

Metropolitan-wide environmental challenges are represented by SO₂ emissions, which are part of the “grey” agenda. The city-wide challenges relate to pollution of air and water. The curve for SO₂ per capita by income demonstrates the “inverted U” shape of the Environmental Kuznets Curve (EKC). This relationship represents the decreasing environmental quality

associated with rapid development, followed by increasing environmental quality once some turning point is reached.

The CO₂ emissions per capita is used as a proxy for global challenges associated with the “green” agenda issues. Increases in CO₂ emissions result primarily from energy consumption by industry, commercial and residential buildings, power production and motor vehicles. Historically, this curve seems to increase exponentially with wealth (see also Bernstein and others, 2007).

The graph also shows the extent to which these trends overlap. From these estimations it is possible to approximate the share of global urban population experiencing different categories of environmental risks at the same time. The points where the curves meet signify the shifts in the types of environmental challenges. With data on urban population by country and GDP per capita, it is possible to estimate the number of people living under such conditions (table 4). These estimates suggest that the majority of the world’s urban population lives under at least two sets of burdens and over 20 per cent are bearing all three types of burdens.

TABLE 4. ESTIMATED URBAN POPULATION LIVING UNDER VARIOUS ENVIRONMENTAL CONDITIONS, 1995

1995 GDP Category (US\$)	Environmental Challenge	Total Urban Population (thousands) (N)	Share of Total (%)
< 467.74	Lack of Water and Sanitation ("brown" issues)	456,985	17.8
> 467.75 and < 1,071.52	Rising Industrial pollution ("grey" issues), and significant "brown" issues	518,812	20.3
> 1,071.53 and < 3,981.07	High "grey" issues, rising modern risks ("green" issues) and "brown" issues	526,315	20.5
> 3,981.08 and < 14,125.3	High but decreasing "grey" issues, rising "green" issues	296,993	11.6
> 14,125.3	Largely "green" issues	613,480	24.0
Missing		147,610	5.8
Total global urban population		2,560,195	100.0

Source: Peter J. Marcotullio and York-shui F. Lee (2003). Urban environmental transitions and urban transportation systems: a comparison of North American and Asian experiences. *International Development Planning Review*, vol. 25, No. 4, pp. 325-354.

Table 5 presents the results of a survey of water related challenges in individual cities in South-East Asia at different scales and across different income categories. The table suggests that among cities in the region, various challenges emerge simultaneously at different scales. The exception is the high-income category (i.e., Singapore), where the local issues of access to water supply and sanitation and poor drainage have been addressed for most, if not all, of the population. All other cities in the survey, regardless of the level of economic development, are dealing with difficult water-related issues at all scales simultaneously.

Finally, Yamamura (1983), compared the development of urban water supply systems in Tokyo with that of England and Wales. The author suggests that in Japan, the transitions between phases of development of the system occurred faster and with more overlap than in cities of the United Kingdom. In general, the evidence broadly demonstrates the shifting transitions and overlapping nature of the Asian experience.

TABLE 5. SUMMARY OF VARIOUS WATER RELATED CHALLENGES FOR CITIES IN DIFFERENT INCOME CATEGORIES IN SOUTHEAST ASIA, BY SCALE OF IMPACT

City	Local	Metro-wide	Regional and global
<i>Low-income cities</i>	Low levels water supply coverage Low levels of sanitation coverage Poor drainage	River and coastal water pollution Overdrawn groundwater Subsistence Coastal area degradation Flooding	Economic water scarcity Vulnerability due to climate change
<i>Middle-income cities</i>	Low levels of water supply coverage Low levels of sanitation coverage Poor drainage	River and coastal water pollution Overdrawn groundwater Subsistence Coastal area degradation Flooding	Economic water scarcity Vulnerability due to climate change
<i>Upper-middle income cities</i>	Low levels to incomplete sanitation coverage Water supply coverage not complete poor to inadequate drainage	River and coastal water pollution Overdrawn groundwater Subsistence Coastal area degradation Flooding	Increasing water consumption per capita Vulnerability due to climate change
<i>High income cities</i>		River and coastal water pollution Coastal area degradation	Physical water scarcity Increasing water consumption per capita Vulnerability due to climate change

Source: Peter J. Marcotullio (2007). Urban water-related environmental transitions in South-east Asia. *Sustainability Science*, Vol. 2, No. 2, pp. 27-54

NOTE: Cities in low income category include Vientiane, Phnom Phen, Hanoi, Ho Chi Minh, among others.
Cities in the middle income category include Manila, Jakarta, among others.
Cities in the upper-middle income category include Bangkok, Kuala Lumpur, among others.
Cities in the high income category include Singapore.

Tokyo is well known for successfully addressing pollution of different types. For example, while it was confronting poor air conditions (see below and Sawa, 1997), it was also addressing water-supply problems, such as low availability of water prior to the 1964 Olympics, and sewage problems. In 1965, only 35 per cent of the population of Tokyo's ward district resident population was serviced by sewers. It wasn't until 1970 when at least 50 per cent were serviced and as recently as 1985, 15 per cent remained unserved. Moreover, at that time, approximately 35 per cent of Tokyo's Tama district was without sewer system (Marcotullio and others, 2003). Tokyo remains a model to study in the way it addressed an array of environmental burdens simultaneously.

4 Comparative intensity of socio-ecological change

This section presents data and analysis that assess the impact of current urban socio-ecological trends, and analyse how these trends compare to those observed historically in the

developed world. The hypothesis is that the changes in the impacts are related to the compressed and geographically extended transitions in the Asia-Pacific region. The results however, are not so clear-cut. In some cases, the impacts of environmental challenges are smaller than those experienced by the developed world, and in particular, the United States. In other cases, however, shifts in transitions have created more intensive interactions within local socio-ecological sub-systems in cities of the Asia-Pacific region.

Differences are explored in terms of CO₂ emissions from total energy consumption, food consumption, high-rise buildings and soil pollution levels in cities. The differences in total CO₂ emissions by income, and the differences in road transport CO₂ emissions by income in rapidly developing Asian countries and in Japan as well as in various developed countries are mapped. Also, it is found that trends in SO₂ emissions follow similar patterns in Tokyo and New York, but that the trend-line in Tokyo falls consistently below that of New York. That is, SO₂ emissions are lower in Tokyo at any given point in time.

On the other hand, however, a comparison of the consumption of food in the form of kilocalorie (kcal) per capita per day over income shows that the average daily material consumption is higher in many developing countries than in the United States.

A comparison of the number and size of high-rise buildings cities in the region and around the world will now be discussed. Cities in developing countries of the Asia-Pacific region have a larger number of high-rise buildings of greater size than cities in North America and Europe.

Figure 7 presents an analysis of total CO₂ emissions in the United States, Japan and several Asian-Pacific countries. It shows that, at any level of GDP per capita, emissions of carbon from developing countries in the Asia-Pacific region were lower than those of the United States. The only country that has emission levels close to that of the United States is Singapore. The higher levels of per capita CO₂ emissions in Singapore are probably due to its role as an oil-refining center within the Southeast Asian region (Schulz, 2007).

Figure 7: Comparative changes in carbon emissions per capita by GDP per capita

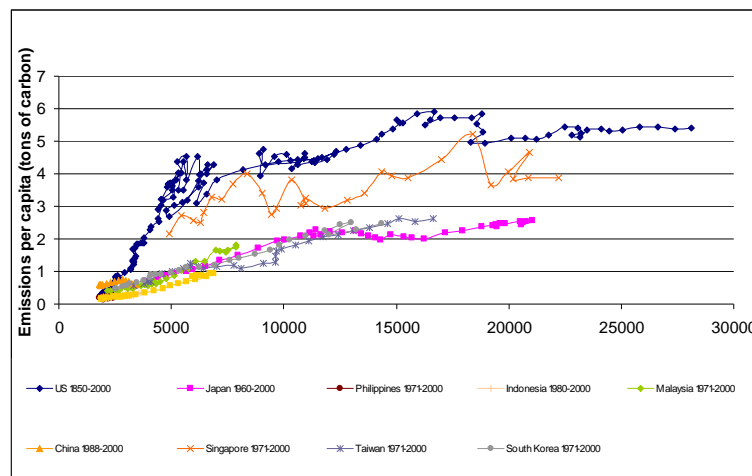
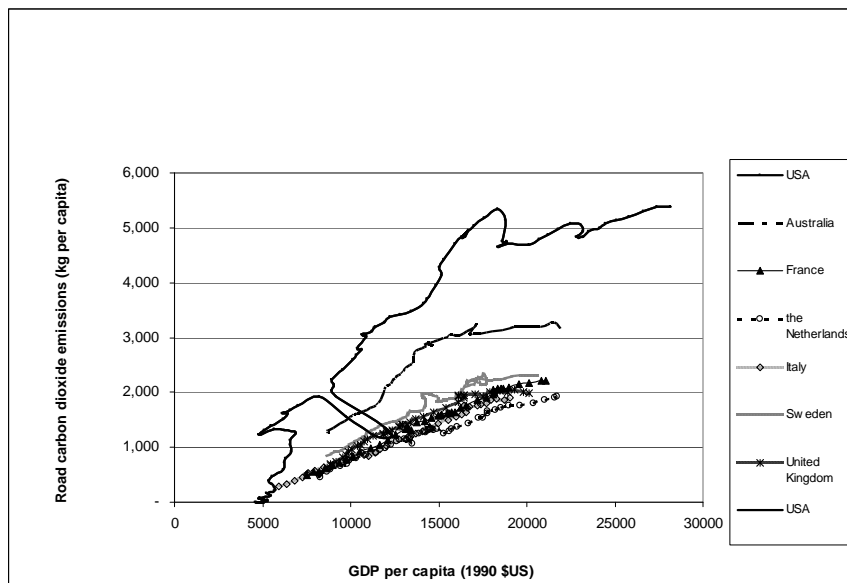


Figure 8 presents the trends in road CO₂ emissions in several developed countries (Sweden, the United Kingdom, Australia, the Netherlands, France and Italy) and figure 9a shows the differences between road CO₂ emissions trajectories in these countries and the Asia-Pacific

region. For visual clarity, the plots provide data at ten-year intervals. Interesting differences among nations emerge from these figures. To highlight differences in trends, the area between the lowest emission in European countries (the Netherlands) and that of Australia has been shaded. When compared to various developed countries, three sets of trends among Asia-Pacific countries emerge as seen in figures 8a, 8b and 8c.

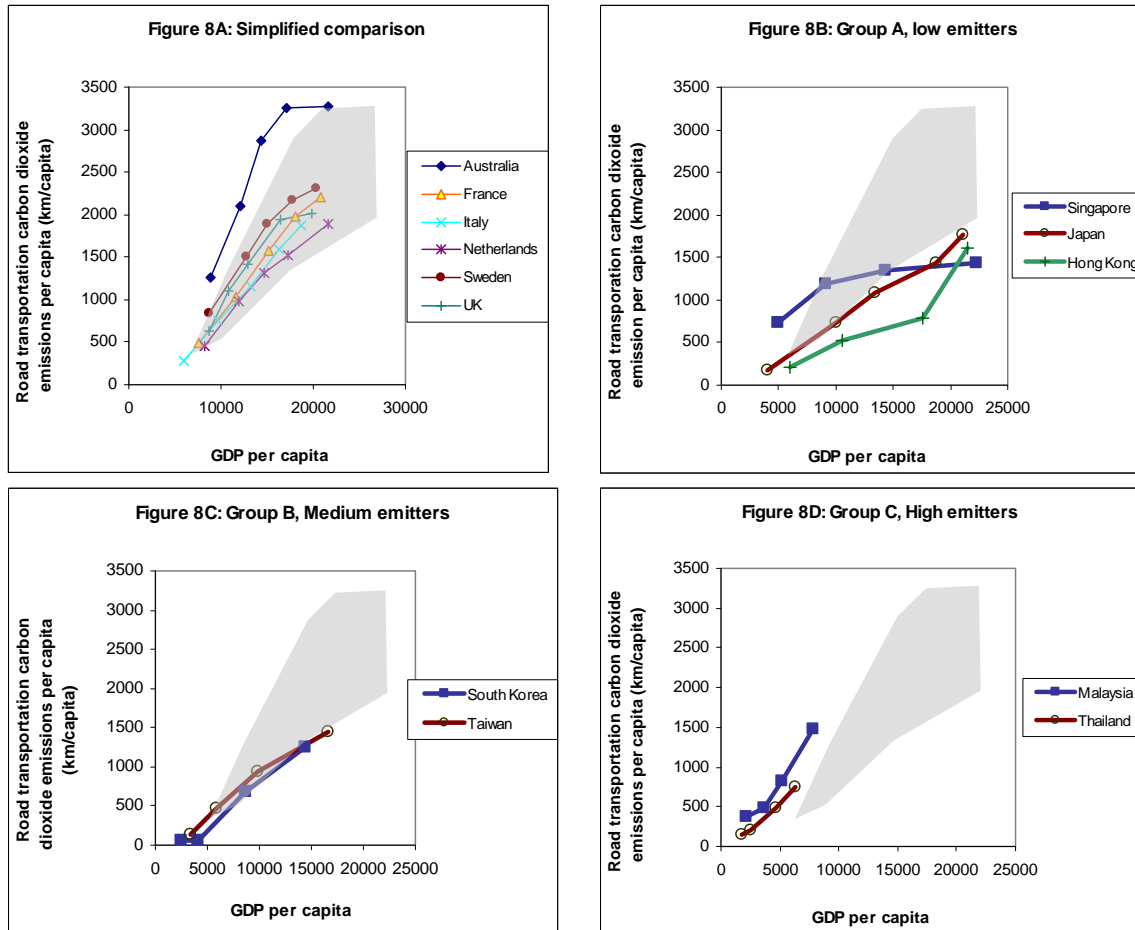
Figure 8: Road carbon dioxide emissions per capita by GDP per capita, USA and selected developed economies



Some Asian-Pacific countries (Hong Kong SAR of China, Japan and Singapore, Group A; figure 8b) currently exhibit emission levels below those of the United States, Australia and Europe. In a few cases, at a specific income level, emission levels were slightly higher for a Group A country, Singapore, for example, than for the lowest-emitting European country. However, such exceptions are rare. In all cases, *current* emissions are lower for Group A countries than for European countries. The different slopes—less steep for the Group A countries than for the European countries—suggest that, in the near future, the emissions for Group A countries will remain below those of European countries.

A second group of Asia-Pacific countries (Korea and Taiwan Province of China) appear to be following the same trends as low-emitting European countries (Group B, figure 8c). Emission trends for Group B countries are only slightly higher than those of Group A countries—just enough to place this group inside the grey area.

Finally, some Asia-Pacific countries have road CO₂ emissions above the level of European countries and Australia (Group C, figure 8d). For example, emission trends for Malaysia and Thailand suggest that future emissions (at comparable income levels) will continue to surpass emission levels of Sweden and possibly Australia. Hence, while there are some efficient transportation-transit systems in the Asia-Pacific region; there are examples of countries that are following North American and Australian patterns in terms of greenhouse gas (GHG) emissions.

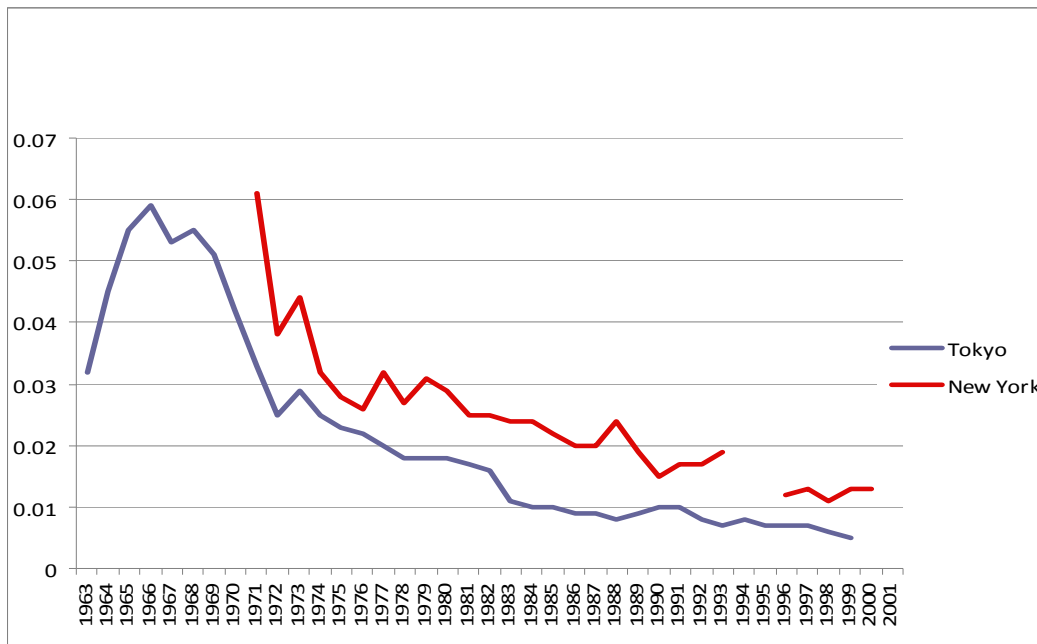


Air pollution and its association with development were also examined. Figure 9 indicates that, since the 1970s, the levels of SO_2 emissions in the cities of New York and Tokyo have been falling. Throughout this period, however, the levels of SO_2 (in parts per million–ppm) were consistently lower in Tokyo. After the war, Tokyo was able to rebuild at lower emission levels than the United States, and in particular, New York. Notably, the GDP per capita of Tokyo during this period was lower than that of New York, suggesting that, if these cities were compared along income lines, Tokyo would fall further to the left of New York. Also important is that Tokyo's population was growing rapidly and, by the early 1960s, had exceeded that of New York, meaning that, if measured in per capita terms, Tokyo's trend lines would be even further below the New York curve.

With regard to the consumption of food calories, figure 10 shows that with increasing income, Americans consume a larger amount of calories per day. This is consistent with the current obesity crisis in the country (Abelson and Kennedy, 2004). Interestingly, however, food consumption is increasing even faster in countries of the Asia-Pacific region, such that for some countries, per capita calorie consumption is even higher than that of the United States at comparable levels of income (exceptions include Japan and Thailand). Nutritionists have also noted rapid increases in calorie intake in some Asian countries. Popkin and Bisgrove (1988) summarized the literature on the differences in dietary intake patterns in urban and rural areas, suggesting that as people move to cities, diets tend to shift to superior grains (rice or wheat rather than corn or millet), more milled and polished grains, food with higher fat content, more animal

products, sugar, processed food and food prepared away from home. This has been part of the nutrition transition and the differences tend to be more marked in lower income countries than in higher income countries (Popkin, 1999). Moreover, unique dietary and nutritional patterns are emerging, suggesting that in some lower- and middle-income countries, the transition and resulting changes in activity and body mass are occurring more rapidly and at lower levels of income (Popkin, 2002). This study demonstrates that in China, from 1989 to 1997, the proportion of underweight men and women dropped considerably and the prevalence of both overweight and obese men more than doubled (from 6.4 to 14.5 per cent) while that of women increased by 50 per cent (from 11.5 to 16.2 per cent). These results for the nutrition transition are similar to those presented in this paper for environmental transitions in general.

Figure 9: SO₂ levels (ppm) in New York City and Tokyo, 1963-2001



Similar trends are observed when comparing the number and size of tall buildings in cities of the Asia-Pacific region and of the developed world. Table 6 reports on an analysis of the top 100 cities with the largest number of buildings of twelve storeys and higher. It shows that of the 52 cities in the developing world on the list, 31 are located in the Asia-Pacific region. Moreover, these 31 cities already have over 22,000 such buildings, or almost as many as the 41 cities in the developed world that are in the top 100 ranking, which gave a total of over 24,000 buildings. That is, the cities located in the Asia-Pacific regions have already built almost the same number of tall buildings that had been built in the cities of the developed world on this list. Moreover, not only do cities of developing Asia-Pacific countries have a higher average of tall buildings than cities in developed countries, but there are also taller. This means therefore, that in the short period of time during which Asia Pacific cities have undergone their growth boom, they have been building more and taller buildings than the developed world. Not only does this trend suggest a new type of “skyscraper city” as emerging, but this level of construction activity implies that Asia-Pacific cities have been consuming more construction materials such as concrete, steel, etc., than the developed world did in the past.

Figure 10: Comparison of Caloric Intake by GDP per Capita

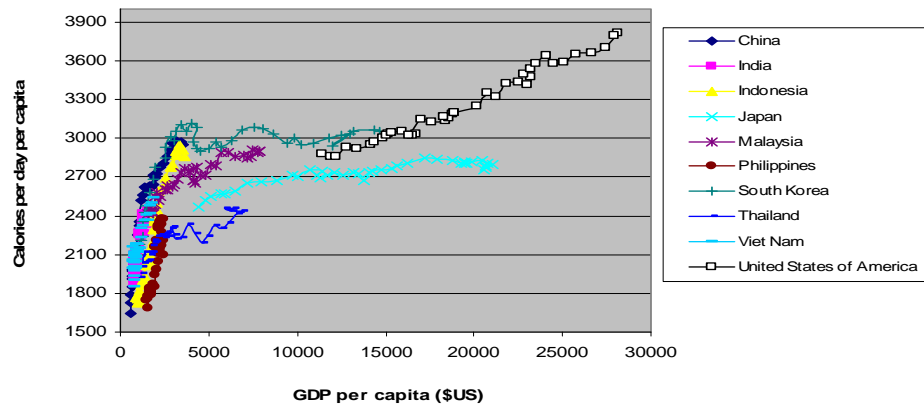


TABLE 6. COMPARATIVE ANALYSIS OF NUMBER OF TALL BUILDINGS IN THE 100 TOP RANKED CITIES WITH TALL BUILDINGS, 2008

Economy status	Number of Cities	Total buildings of 12 storeys or more	Average number of tall buildings per city	Total points for buildings*	Average points per building
Developed countries	41	24,328	593	146,777	6.0
Developing economies	52	44,227	851	315,886	7.1
<i>of which are in the Asia-Pacific</i>	31	22,307	720	256,462	11.5
Transition economies	5	5,731	1,146	11,142	1.9
Mid-Eastern oil rich economies	2	458	229	8,425	18.4

NOTE: Points for building sizes were allocated in the following manner

- 12..19 floors = 1 point
- 20..29 floors = 5 points
- 30..39 floors = 25 points
- 40..49 floors = 50 points
- 50..59 floors = 100 points
- 60..69 floors = 200 points
- 70..79 floors = 300 points
- 80..89 floors = 400 points
- 90..99 floors = 500 points
- 100+ floors = 600 points

Source: Peter J. Marcotullio (2010) Urban Soils. In Ian Douglas, David Goode, Mike Houck and Rusong Wang eds. *Handbook of Urban Ecology*. London, Routledge Press (forthcoming)

Table 7 shows data from a survey of studies (Alloway, 1995) on the pollution levels in soils of cities of the now developed world (the United States, Europe and Australia) with some cities in East and Southeast Asia. The heavy metals examined include lead (Pb), zinc (Zn), copper (Cu), cadmium (Cd), chromium (Cr), cobalt (Co) and nickel (Ni). All these chemicals have a variety of sources including industries, household items and fossil fuel consumption. As soil pollution is largely cumulative, the cities of the North might be expected to demonstrate far higher levels of heavy metals, but this is not the case. The averages for cities in the developed

world compared to those of the developing world, suggest that despite the more recent industrializations of some of the cities in Asia, soil pollution conditions are comparable to those of the North. Except for lead, the averages for all other heavy metals in Asia-Pacific cities were comparable to those of cities in developed countries or in the cases of chromium, cobalt and nickel even exceeded the average for the developed world (Alloway, 1995).

TABLE 7. HEAVY METAL CONCENTRATIONS (MG/KG) IN URBAN SOILS FROM DIFFERENT CITIES IN THE WORLD

City	Country	Pb (mg/kg)	Zn (mg/kg)	Cu (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Ni (mg/kg)	Reference
<i>Developed economies</i>									
Brussels	Belgium	113	34	19	1				32
Hamburg	Germany	218	516	147	2	95		63	5
Naples	Italy	262	251	74		11			27
Rome	Italy	331		0					1
Aviles	Spain	188	476	104	3	27	14	19	29
Central Madrid	Spain	621							8
Coruna	Spain	309	206	60	0	39	11	28	7
Cuenca	Spain	293	509		0				24
Madrid	Spain	161	210	72		75	6	14	29
Mieres	Spain	92	233	57	1	20	16	34	29
Salamanca	Spain	53			1				6
Seville	Spain	156	120	55	3	38		21	20
Stockholm	Sweden	104	157	47	0	27		9	31
Aberdeen	UK	94	58	27		24	6	15	11
Birmingham	UK	180	205	143	1				12
Glasgow	UK	216	207	97	1				13
London Boroughs	UK	294	183	49	1				14
Boston	USA	800							3
Pittsburg	USA	398			1				2
Average		257	240	68	1	40	11	25	
<i>Developing economies</i>									
Hong Kong	China	93	168	25	2				15
Xuzhou	China	43	144	38	1	78	12	34	19
Koyang	South Korea	88	238	59	2	47	24	47	22
Uijeongbu	South Korea	65	204	41	1	27	10	23	22
Manila	Philippines	214	440	99	1	114			16
Bangkok	Thailand	48	118	42	0	26		25	10
Danang-Hoian	Vietnam	4	142	76	1	92	34	23	26
Average		79	208	54	1	64	20	30	
<i>Transition economies</i>									
Warsaw	Poland	53	140	25	1	13		12	4
Zagreb (agricultural soil in the city)	Serbia	26	78	21	1			50	30
Average		39	109	23	1	13		31	
WHO (1996) guidelines			200	30		100	17	80	

Source: Peter J. Marcotullio (2010) Urban Soils. In Ian Douglas, David Goode, Mike Houck and Rusong Wang eds., Handbook of Urban Ecology. London, Routledge Press (forthcomng)

Socio-ecological system development depends also on the total levels of consumption emissions and pollution that result from the interaction between the ecological system and the social system. That is, in addition to per capita values total flow must also be considered. In this regard, it was found that in the region, not only are the flows high, but they are predicted to increase over the coming decades. Two important influences on these patterns of interactions are growth in income and population. The World Bank (2007) predicts that by 2030, “1.2 billion people in developing countries, 15 per cent of the world’s population, will belong to the global middle class, up from 400 million today” (World Bank, 2007, p. xvi). Middle class families are those with an income between \$16,000 and \$68,000 in PPP dollars. This enormous emerging middle class will have the purchasing power to buy automobiles, many consumer durables and travel abroad. By 2040, automobile consumption in India and China alone will double the total number of vehicles currently on the road (i.e., add 800 million automobiles to the current global car stock (Wilson and others, 2004; The Economist, 2006).

F. DISCUSSION

The patterns of “earlier, faster and more simultaneous” development and the different socio-ecological conditions are arguably due to various drivers, direct and indirect. In this section, attempt is made to outline some of the possible causes of the results presented in the previous section.

The early emergence of environmental impacts (such as those related to transportation CO₂ emissions) resulted from among other factors, the availability of technology. Certainly, the fact that automobiles were not available in the United States, when it was at similar levels of income of those of Viet Nam today, is an important factor in explaining some of these observed impacts.

Technological diffusion will also depend upon trade and investment policies. Moreover, once the technology is available its adoption is affected by a number of national and local conditions and policies. For example, automobile technologies were available well before the 1990s, but cars were rare within China. It wasn't until the country began to open its economy and after it implemented a policy targeting the motor vehicle industry as a major pillar of industrialization (Gan, 2003; Lee, 2007), that transportation CO₂ emissions commenced. Moreover, not all technologies are diffusing rapidly. Some observers have noted that telecommunications and transportation technologies that are crucial to enhancing global flows, are typically privileged (Sassen, 1991; Sassen, 1994; Lo and Yeung, 1998). In Viet Nam, while there is wide availability of internet, it is still common to see farmers outside of Hanoi using oxen and wooden plows in rice paddies.

The speed of change is associated with the speed of economic growth. That is, city building and development has largely occurred during periods of economic expansion and slowed during recessions. Moreover, the intensity and speed at which a city expands is related to how fast the local economy is growing. Table 8 presents ten-year annual averages in changes of economic growth for several countries. It suggests that growth rates for developed countries during any period of industrialization after 1870 have been lower than those of Asia today. With Asia's rapid economic growth rates have emerged faster changes in a number of environmental issues, including those related to consumption and waste emissions.

While it is clear that the economic growth rates in countries throughout the region have been faster than those of the developed world, the differences in speed of the environmental transfers of the developed and developing world are not that clear cut. Many have suggested that contemporary developing world urbanization is occurring faster than that experienced by the developed world (Preston, 1979; Williamson, 1988; Brockerhoff, 1999; Brockerhoff, 2000; Smart and Smart, 2003).

Satterthwaite (2007), on the other hand, has compared the growth rate of cities (different from urbanization) in the developed and developing world based on the size of settlement. He finds that Tokyo (4.4 per cent per year) and New York (4.3 per cent per year) have similar to or higher growth rates than Addis Ababa (3.8 per cent per year) and Bangalore (4.1 per cent per year). Los Angeles (7.6 per cent per year) has a higher growth rate than Nairobi (5.7 per cent per year) while Chicago (8.4 per cent per year) and Las Vegas (7.6 per cent per year) have comparable or higher growth rates than Abidjan (8.0 per cent per year) and Dar es Salaam (6.7 per cent per year). He concludes that cities are not growing faster in the developing world, but rather that cities in the developed world have consistently grown as fast or faster. This analysis

parameterizes cities by their size, suggesting that cities of the same size should grow at similar rates. But this may not necessarily be the case as there is no reason to believe that size of cities impacts their growth rates. Rather, as he points out, the most important determining factor for urban growth is economic growth and investment. The dynamics associated with migration and natural increases are also important determining factors. If the cities were compared over similar ranges of economic growth, as is done in this study, the results would be different.

TABLE 8. ANNUAL GROWTH OF GDP PER CAPITA IN SELECTED COUNTRIES, BY DECADE, 1870-2000 (PERCENTAGE CHANGE)

Country	1871-1880	1881-1890	1891-1900	1901-1910	1911-1920	1921-1930	1931-1940	1941-1950	1951-1960	1961-1970	1971-1980	1981-1990	1991-2000
Australia	2.65	0.01	-1.50	3.10	-0.68	-0.42	3.54	0.88	1.59	3.34	1.61	1.55	2.56
Austria	0.49	1.31	1.41	1.40	-3.27	3.07	1.88	-1.28	5.11	3.63	3.04	2.11	1.53
France	1.11	0.80	1.69	0.48	-0.07	3.96	-0.47	4.77	3.11	4.01	2.24	1.77	1.37
Germany	0.92	1.83	2.22	1.55	-1.96	2.59	3.99	-3.79	6.24	3.15	2.45	1.19	1.14
Italy	0.48	1.29	0.79	2.13	0.50	1.44	2.00	0.20	4.70	4.31	2.94	2.14	1.26
UK	0.43	1.17	1.23	0.35	-0.35	2.06	2.93	-0.75	1.96	1.97	1.69	2.57	2.08
USA	1.47	1.51	1.67	1.07	0.96	1.56	2.11	1.54	1.14	2.80	1.96	2.10	2.13
Canada	0.34	1.55	1.91	2.76	-0.87	3.66	2.98	1.88	1.51	3.16	2.56	1.37	1.95
Japan	1.53	2.01	2.12	0.78	2.26	-0.05	4.58	-3.95	6.49	8.18	2.95	3.17	0.88
South Korea	-	-	-	-	2.66	-0.30	3.83	-6.08	4.54	5.69	5.02	7.30	4.30
Hong Kong	-	-	-	-	-	-	-	-	3.16	5.79	5.81	4.59	1.66
Singapore	-	-	-	-	-	-	-	-	0.25	6.25	6.33	4.27	4.14
Taiwan	-	-	-	-	-	2.33	2.37	-4.33	4.17	6.75	5.85	4.73	4.69
Indonesia	1.53	2.01	2.12	0.78	2.26	-0.05	4.58	-3.95	6.49	8.18	2.95	3.17	0.88
Malaysia	-	-	-	-	3.32	4.29	-1.90	2.33	0.61	2.70	5.31	2.99	3.75
Philippines	-	-	-	-	3.15	-	0.96	-	2.52	1.55	2.77	-0.75	0.99
Thailand	-	-	-	-	-	-	-	-	2.42	4.42	4.01	5.72	2.48
China	-	-	-	-	-	-	-	-	3.45	3.46	2.94	5.35	5.85
Vietnam	-	-	-	-	-	-	-	-	1.68	-0.99	0.05	3.02	5.25
Argentina	-	-	-	2.87	-0.75	1.63	1.15	1.48	0.92	2.22	0.86	-1.65	2.04
Brazil	0.48	0.48	-1.29	0.52	1.43	0.85	2.21	2.49	3.21	2.29	4.71	0.15	1.28
Mexico	-	-	-	1.45	0.66	-1.26	1.20	1.95	2.45	3.14	3.73	-0.88	1.44

Source: Calculations from data providing from Maddison (2001)

NOTE: "-": data not available for calculation

Data for 1871 for all calculations is for 1870.

The differences in speed of change are also related to trade and international capital flows that are occurring at greater speeds. Taken together, all these flows associated with globalization including new technologies, have facilitated the second global wave of urbanization (Held and others, 1999; UNFPA, 2007). As observed, many of the changes noted in the comparative analyses have been impacted by changes in global conditions.

The simultaneity of changes found in contemporary cities may be related to two different phenomena. First, in the past, technologies and advances in urban infrastructure were experienced in roughly sequential stages. For instance, in cities of the United States, water

supply systems were developed before sanitation systems. After sewers were built, it took another 20 to 30 years before the conditions of the recipients of wastewater, i.e., large rivers, became contaminated enough for wastewater treatment to be considered. Finally, it wasn't until the 1950s, when rivers in the United States were polluted by chemical waste and a discussion for more intensive water treatment begun. This history outlines that for many, if not most environmental transition cases, the solution to one problem generated other problems. For example, dumping untreated wastewater into rivers solved one problem but created another.

In the Asia-Pacific region, however, a number of these technological and infrastructural opportunities were already and advances in some fields potentially facilitated responses in others. For example, advances in health services helped to reduce the spread of infectious disease among the urban populations without urban-wide demand for environmental sanitation. The potential to develop and industrialize technologies rapidly is available, without the demand for regulation. This may be so because in the past, as any of the above-mentioned conditions worsened, they affected everyone, both rich and poor alike. Nowadays, technologies and social organization have facilitated the ability of the rich to avoid these impacts. The danger of this is that some problems remain unresolved for large segments of the population, while wealth, new technologies, globalization, etc., create different environmental conditions within the same city.

Second, on a regional or global level, ecosystem conditions are changing. Hence, with changes in climate variability, even the lowest income countries that are still affected by the "brown agenda" will need to adjust their practices in the future and at the same time, address these larger global issues.

Third, the diverse economic, social and environmental phenomena within cities of the developing world is difficult to generalize (Amin and Graham, 1997; Amin and Graham, 1999). This increasing diversity is related to the political, social and institutional organization of societies. Notably, neo-liberal policies and the privatization of public services in urban areas have led to the "splintering" of urban areas, which resulted in zones of access and zones of non-access to services in all cities (Amin and Graham, 1997). "Splintering" of urban areas within developing countries may be even more intense than experienced by the developed world, and as many cities in the developing world lack basic infrastructure for large populations, the 'splintering' process can have long lasting implications.

It is paradoxical that despite the diversity, complexity and rapidity of change in socio-ecological transitions, some of the environmental impacts in the contemporary developing world (for example, those related to energy transitions) are less harmful than those produced by the developed world, at similar levels of income. Presumably, developing countries are benefiting from technology transfer and growing wealth in a more efficient manner than the developed countries had.

The lower levels of emissions or greater efficiency, may also be due in some cases to "infrastructure bottlenecks" as the lack of necessary facilities (such as roadways) may be preventing the widespread use of automobiles, for example (Marcotullio and Williams, 2007). This theory suggests that as more infrastructure is developed (highways, electricity generating stations, etc), the use of fossil fuel will continue to increase at rapid rates. Certainly more research into development patterns is necessary before it could be properly understood how these trends will play out in the future.

On the other hand, the impacts of consumption related activities could emulate first world development styles, for example, it was found that the widespread construction of skyscrapers in Asia as cities attempt to develop an image of the modern city based upon models of Manhattan or

London or other cities in North America and Europe. Some cities have more skyscrapers than even the models they are based upon. Citizens of developing countries are now consuming more calories than before, partly because food is cheaper than in the past and are produced with more fat and carbohydrate contents. Finally, as industrialization and motorization have progressed rapidly in many cities throughout the region, there has been massive damage to the ecosystem as demonstrated by soil pollution, despite the existence of regulatory frameworks, and availability of advanced pollution reduction technologies. Better measurements are increasing knowledge on the level of these contaminants in various ecological media (land, air and soil) and may generate the political will to reverse these trends.

G. IMPLICATIONS

There are many implications of these findings. First, environmental challenges have emerged earlier and developed faster than they did in the now developed world, which means that policy interventions need to be based on the current conditions in specific regions and cities. Countries cannot just adopt policies of the past.

Second, the Environmental Kuznets Curve (EKC), which suggests that as cities or countries grow in wealth, the environmental impact associated with that process grows and then reverses, must also be considered in a more regional and city-specific perspective. While there may be some processes that follow the EKC pattern, they are verified at particular scales only. Once socio-ecological relationships at different scales can be observed, different relationships can be seen, some of which do not follow the stylized reverse pattern.

Third, by examining ecological features of city growth, it was observed that not all local issues are necessarily resolved with increasing wealth as implied by the urban transition theory. Urban transition theory suggests that local environmental challenges (lack of water supply and sanitation and air pollution, etc) are normally resolved with increasing wealth, but that local communities thereafter are overcome with larger-scale issues (airshed and watershed pollution, for example). This paper suggests that under current development conditions and soil pollution, for example, can possibly reach higher levels of severity. Indeed, lower-income cities are experiencing similar or even higher levels of heavy metal contamination in their soils, compared to cities in the developed world. It would be important to also examine other ecological relationships, such as biodiversity, hydrology and local atmospheric conditions. Some of these impacts are difficult to address and expensive to reverse with current technology. Soil remediation for instance, is one such case. Their resolution therefore, is not expected in the near future.

Further, the findings in this paper suggest that cities of the contemporary developing world have less revenue to address environmental problems (although this may be offset by the application of better and cheaper technologies) than developed countries had in the past. Given the rapid pace of urbanization and the diverse trends occurring across and within cities, the management of environmental problems are complex and there is a real risk of institutional capacity overload and thus of unresolved environmental problems.

Given these conditions, it is increasingly questionable whether policies, even sustainable urban policies, which have been successful in cities of the developed world, are applicable to the developing world. Environmental policies in the North were underpinned by such mentalities as “first things first” (Warner, 1955) and “the solution to pollution is dilution.” In a world already polluted and facing an increasing number of anthropogenic impacts, this approach to policy does not appear to be very realistic.

Also, it cannot be discarded that some solutions to challenges may exacerbate problems at other scales. For example, the idea of compact city or even concentrated decentralization has questionable application to parts of the developing world for the following reasons. First, many parts of the developing world are already compact (particularly in some Asian cities), as they have not decentralized their populations as much as those in the developed world. Second, given the economic structure and the presence of industrial activities and other stationary sources of air pollution, this solution, which theoretically reduces energy use and hence greenhouse gas emissions at the global scale, may actually increase exposure to residents as industries are compacted into the urban landscape (local scale). That is, while compact cities may help to decrease the use of motor vehicle in developing countries, they can also exacerbate other types of risks, such as congestion and increased local air pollution.

It would thus seem that cities in the Asia-Pacific region should look to the historical experience of cities of the North for solutions to environmental problems, and more importantly, to examine how Japanese, Korean and Taiwanese (Province of China) cities and Singapore are addressing their environmental burdens. Tokyo's ability to plan for mass transit and attack multiple environmental challenges simultaneously is a useful model to consider, learning also from its shortcomings. For example, part of the Japanese strategy was to "grow now, clean later," which led to mercury and cadmium poisoning. The country, however, quickly learned from these mistakes and Tokyo currently has clean environmental technologies in place (such as sophisticated municipal incinerators, reduced water consumption and runoff systems), and strictly enforces pollution compliance laws. Singapore has also implemented many advanced and innovative strategies on various ecological fronts including land, water, and air, to address its environmental concerns, among other good examples originating in the Asia-Pacific region.⁷

Therefore, while many challenges and issues remain, developing cities within the Asia-Pacific region have the opportunity to confront them, across geographic scales and functional sectors (transportation, water supply, sanitation, etc.), in an integrated manner, early on in the infrastructure development process.

This paper also suggests that some of the gloomy predictions of exploding unmanageable cities of the developing world (Linden, 1996) with egregious environmental impacts (Kaplan, 1994) should be tempered. Lower per capita levels of globally impacting emissions is encouraging and demonstrates that economic development can proceed without high levels of emissions. Higher efficiencies and earlier movement away from coal to gas is important and seems to be gradually occurring.

The Asia-Pacific urban experience is also a result of previous successes, which have shifted underpinning development patterns. During the seventeenth and eighteenth centuries, many cities in the United Kingdom would have remained stagnant had it not been for massive rural-urban migration, although cities were unhealthy and those that lived in rural areas typically lived longer (Williamson, 1988). Moreover, by the turn of the twentieth century, despite the fact that the United States was one of the most economically advanced countries in the world, approximately 18 per cent of new born died before the age of five (Preston and Haines, 1991). As people poured into cities to find employment and new lifestyles, the rural populations decreased. These dramatic processes relieved pressure on rural systems and led to lower overall

⁷ It is not surprising therefore to see some of the currently highly touted solutions to some environmental concerns in cities of the North (such as bus rapid transit, transit oriented development and congestion pricing), as previously developed and implemented, albeit under different names, in the South.

population growth (as fertility levels rapidly decreased with urban living). Today, in the developing world, longevity has increased across the board, but mortality is actually somewhat lower in urban than in rural areas due to better access to health care in cities and nation-wide immunization programmes.

At the same time, however, populations have grown substantially in both rural and urban areas bringing new demographic pressures. For example, in some cities (of Africa), levels of child mortality matched those of the United States at the turn of the twentieth century (Montgomery and others, 2003; Satterthwaite, 2007; UNFPA, 2007). Indeed, the timing and speed of the demographic and urbanization transitions have benefited from increased access to public health, but not for everyone. Intra-urban inequalities in health and quality of life require urgent attention

Some other areas also demand immediate attention, specifically, the ecological damage currently experienced within cities. Severe soil pollution calls for strong regulatory action to identify the sources of these pollutants and develop regulations, guidelines, incentives and community and civil society responses to address them. A clean Air Initiative for Asia should be developed, to reduce some heavy metals, such as lead from gasoline, and promote new public transit technologies throughout the region. Moreover, water quality and general hydrology and biodiversity loss should be examined, so as to identify other areas that may merit priority attention.

In developing new “skyscraper cities” in Asia, construction should be undertaken with the most efficient technologies and strongest materials for high transit use, because many cities lie on or near earthquake fault lines and need to reduce automotive dependence in an era of increasing petroleum costs. In this context, the Japanese models and those implemented in Seoul have been successful in addressing transit problems and in removing highways to provide river park space for its citizens.

H. CONCLUSIONS

This paper has presented a new understanding of the changing socio-ecological contexts that accompany urbanization in the Asia-Pacific region. It argues that local socio-ecological systems have undergone shifts unlike those of the developed world. Socio-ecological challenges in Asia-Pacific cities are emerging sooner; conditions are changing faster and problems emerging more simultaneously than they did in the now developed world. Moreover, there are conflicting trends concerning the intensity of impacts. At the regional and global levels, the per capita impacts are lower than those experienced by the developed world during similar economic income ranges. Some of the local ecological challenges, and those associated with consumption, appear to be greater and more difficult to tackle.

Existing policies to address the region’s urban challenges are more pertinent than those of the now developed world outside the region. There are a number of successful solutions from cities in the region that should be considered seriously, particularly those of Singapore, Tokyo, Seoul and Taipei. Some ecological conditions such as soil pollution, require immediate and strong responses. The construction of buildings should be undertaken with the most efficient use of materials and advanced technologies, and various means of public transportation should be offered.

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DEMOGRAPHIC ASPECTS OF CLIMATE CHANGE, ENVIRONMENTAL DEGRADATION AND ARMED CONFLICT

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A. INTRODUCTION

Demographic and environmental pressures have featured prominently in the debate over the new security challenges in the aftermath of the Cold War. In the *resource scarcity* literature, high population growth and density are seen as major causes of scarcity of renewable resources like arable land, fresh water, forests and fisheries. Arguably, such scarcities may trigger armed conflict over resource access. The claim of a relationship between population growth, resource scarcity and conflict emerged with the increasing environmental awareness of the late 1960s (see, for instance, Ehrlich, 1968). After the end of the Cold War, population growth and resource scarcity became subjects of both popular accounts of violence (Kaplan, 1994), as well as of large academic research programmes (see, for example, Homer-Dixon and Blitt, 1998; Baechler, 1999). This paper summarizes the findings of a doctoral project aimed at systematically investigating the relationships between population pressure, resource scarcity and armed conflict. The project encompasses a set of cross-sectional time series analyses conducted both at the State and sub-State levels (Urdal, 2005; Raleigh and Urdal, 2007; Urdal, 2008).

It has been argued that population-induced resource scarcity poses a security threat in developing countries with low capacity to prevent and adapt to scarcities (see, for example, Homer-Dixon, 1999). Generally, one of the most robust findings in the quantitative conflict literature is that impoverished and institutionally weak countries with low GDP per capita have an exceptionally high risk of armed conflict and civil war (Collier and Hoeffler, 2004; Fearon and Laitin, 2003; Hegre and Sambanis, 2006). Two key trends arguably contribute to extend the relevance of population pressure and resource scarcity into the coming decades. First, despite declining population growth rates globally, low-income countries, particularly in parts of Asia and sub-Saharan Africa will continue to experience very significant population growth rates in the near future. Second, these areas are also the ones expected to face the most severe consequences of global climate change (Stern and others, 2006).

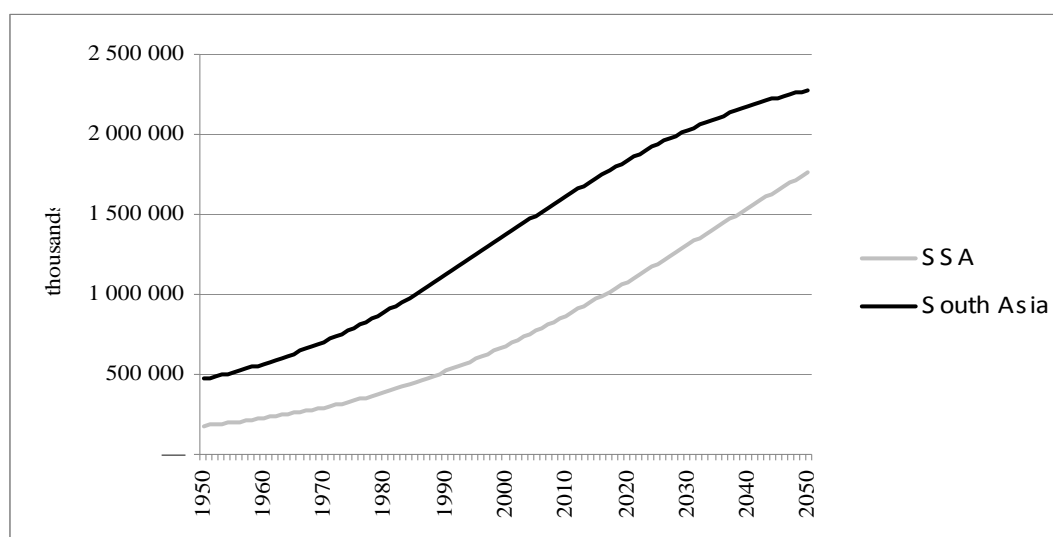
B. TRENDS IN POPULATION, RESOURCES AND CONFLICT

1. *Population trends*

The total world population has increased from 2.5 billion in 1950 to nearly 6.8 billion in 2007 (United Nations, 2007, p. vii). Population growth accelerated after World War II, when many developing countries entered into the early phase of the demographic transition with decreasing mortality and continued high fertility. The rapid population growth in most developing countries spurred concerns in the 1960s and 1970s that food production would not keep up, and that burgeoning populations would seriously deplete natural resources (Ehrlich, 1968, p. xi). The gloomiest scenarios proved unfounded as food production has kept pace with population increases in most parts of the world, and fertility is now declining in all world regions. As shown in figure 1, the latest medium projection of the United Nations Population Division suggests a total world population of almost 9.6 billion by year 2050 (United Nations, 2007). Another projection (Lutz and others, 2004) expects world population growth to level off during the coming decade, with the most likely predictions suggesting a global population peak between 8 and 9 billion around year 2070. While world population growth is slowing, there are substantial regional

differences. According to Lutz and others (2004) between 2000 and 2070 population growth will be highest in sub-Saharan Africa, even with the toll claimed by HIV/AIDS (Lutz and others, 2004, p. 45). The total population in this region is expected to peak around year 2080 at about 1.5 billion, almost two and a half times that of 2000. The combined population of South Asia¹ and sub-Saharan Africa has grown from 649 million in 1950 to 2.4 billion in 2008, and will continue to grow up to around 4.1 billion in 2050 (figure 1, United Nations medium projection). In relative terms, the population of South Asia and Sub-Saharan Africa has grown from 26 per cent of the total world population in 1950 to 35 per cent in (2008) and it is projected to constitute 43 per cent of the total world population in 2050 (United Nations medium projection).

Figure 1. Total population size in South Asia and Sub-Saharan Africa 1950-2050



Source: United Nations (2007), medium projection.

2. Climate change, forced migration and conflict

Global climate change is likely to lead to or intensify resource scarcity in many areas, and is argued to be a future source of conflict (see, for instance, Renner, 1996; Homer-Dixon and Blitt, 1998; Rahman, 1999; Klare, 2001; Brauch, 2002; Pervis and Busby, 2004; Salehyan, 2008). Population trends are at the heart of this concern. First, increasing temperatures, precipitation anomalies and extreme weather is expected to aggravate situations in areas already experiencing high population pressure and resource scarcity. Second, increasing sea levels, more extreme weather, and local resource depletion could force millions of people to migrate, arguably leading to increased risks of inter-ethnic tensions and higher pressures on resources in destination areas.

Some of the most alarming accounts grossly exaggerate the security implications of climate change. In a report for the Pentagon, Schwartz and Randall (2003) foresee a worst-case scenario where a collapse in carrying capacity “could make humanity revert to its ancient norm of constant battles for diminishing resources” (Schwartz and Randall, 2003, p. 16). Although warning against overstating the relationship between climate change and armed conflict, Barnett (2001, p. 6) and Pervis and Busby (2004, p. 68) accept that the depletion and altered distribution of natural resources, likely to result from climate change, could, under certain circumstances, increase the risk of some forms of violent conflict. Climate change is generally not seen as a likely major or sufficient cause of conflict, but is argued to contribute to a mounting environmental challenge (Brauch, 2002, p. 23; Tänzler and Carius, 2002, p. 8). Although

climate change is usually regarded as a potential future threat, some argue that global climate change has already been a contributing factor in recent conflicts such as in Darfur (Byers and Dragojlovic, 2004, p. 2).

The presence of “climate refugees” and their potential as a source of conflict is one of the most contentious issues. Because of rising sea levels and increased risks of flooding, climate change is expected to contribute to migration from coastal and riverine settlements (IPCC, 2001, p. 36). Extreme weather events and general resource degradation are argued to produce “environmental refugees.” Some estimates put the current stock of “environmental refugees” at around 20 to 25 million, but the term is highly contentious since it is difficult to distinguish between “economic migrants” and those who move because of gradually deteriorating environmental conditions (see, for example, Suhrke, 1997; Castles, 2002). The Stern Review on the economic consequences of climate change states that by 2050, “200 million more people may become permanently displaced due to rising sea levels, heavier floods, and more intense droughts, according to one estimate” (Stern and others, 2006, p. 56). The review received considerable attention and its estimate of 200 million climate refugees has been widely cited. The estimate is often attributed to the Intergovernmental Panel on Climate Change (IPCC), but the IPCC Fourth Assessment Report is very cautious and does not provide any migration estimates. The original source is a 1995 report by a British ecologist, Norman Myers (Myers and Kent, 1995). Stern and others acknowledge that “this estimate has not been rigorously tested,” but claim that it is a conservative estimate that “remains in line with the evidence presented throughout this chapter that climate change will lead to hundreds of millions more people without sufficient water or food to survive or threatened by dangerous floods and increased disease” (Stern and others, 2006, p. 77). A recent report from the non-government organization, Christian Aid, drew considerable attention due to its dramatic estimate of one billion displaced by 2050 due to war, disasters, development schemes, and climate change (Christian Aid, 2007). Although the vast majority (645 million) are thought to become displaced due to “development projects such as dams and mines,” the report also provided a revised estimate by Norman Myers who in an interview with Christian Aid reveals that he “now believes that the true figure will be closer to 250 million” (Christian Aid, 2007, pp. 5-6, 48).

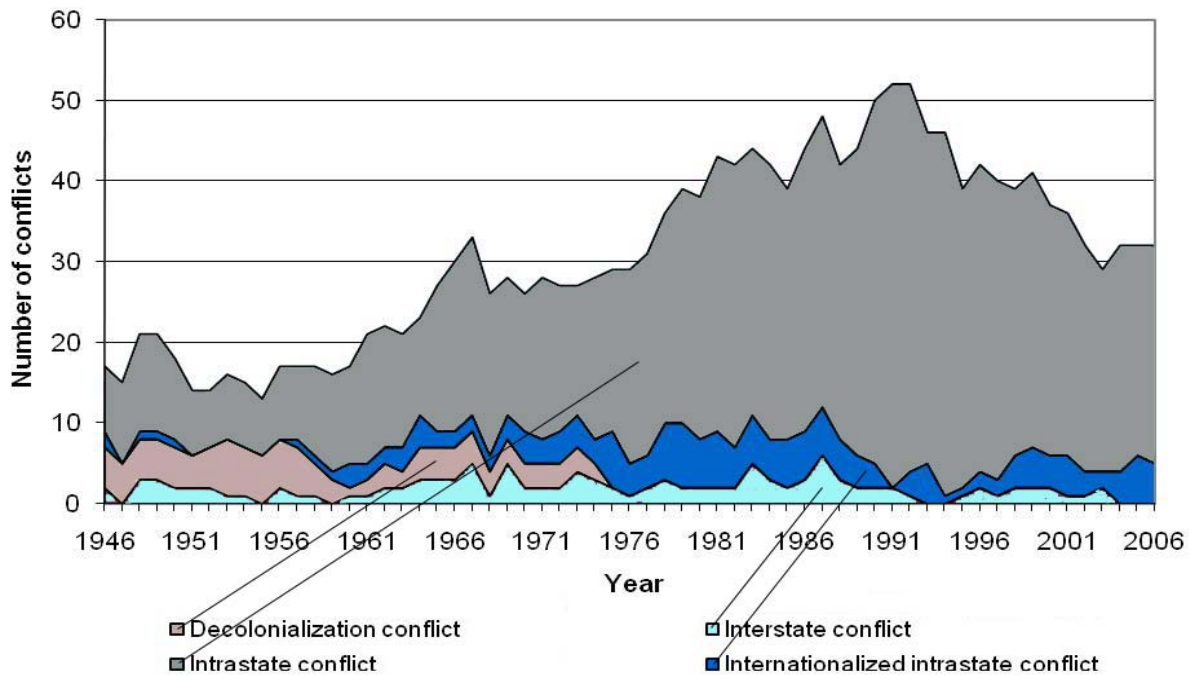
The potential for migration spurred by climate change and its challenges should be acknowledged, but not overemphasized. Some environmental changes associated with climate change like extreme weather and flooding may cause substantial and acute, but mostly temporal, displacement of people. However, the most dramatic change expected to affect human settlements, sea-level rise, is likely to happen gradually, as are processes of soil and freshwater degradation. Improved forecasting skills will make adaptation easier and reduce the problems associated with population displacements (Chimeli and others, 2002, p. 213). Therefore, while abrupt displacements may happen, climate change is primarily expected to result in gradual migration. Furthermore, capable Governments may in some cases be able to prevent or at least drastically reduce large-scale migration in the first place, and government capability is also crucial in determining the pace and conditions for the return of temporarily displaced populations. Finally, individuals respond differently to changes in their environment, and coping and adaptation mechanisms involve a range of options short of permanent migration.

The potential security implications of climate-related migration strongly depend on the destination of migrants. Very few of these migrants are likely to move across international borders, and many will presumably become part of the migration from rural to urban areas that is taking place globally. According to the 2005 World Urbanization Prospects, only between 2005 and 2015, “a total of 250 million to 310 million people in developing countries would be expected to become urban dwellers (...) either because they would migrate from rural to urban areas or because their rural settlements would become urban” (United Nations, 2006, p. 3).

3. Global conflict trends

The International Peace Research Institute, Oslo–Uppsala University (PRIO–Uppsala) dataset (Gleditsch and others, 2002) is published annually in the *Journal of Peace Research*, and contains information on the start date, actors, and intensity levels of all armed conflicts since 1946. The dataset defines a relatively low threshold for conflict, that is, a minimum of 25 battle-related deaths per year. According to the PRIO–Uppsala criteria, an armed conflict is further defined as a contested incompatibility concerning government and/or territory, between at least two parties, of which one is the Government of a State, using armed force (Gleditsch and others, 2002, p. 619). The dataset distinguishes between (low intensity) conflicts (at least 25 battle-related deaths per year, but fewer than 1,000) and wars (at least 1,000 battle-related deaths per year). In this paper, the terms internal armed conflict and civil war are used interchangeably. Figure 2 provides an overview of global conflict trends. The number of ongoing conflicts reached a peak of 53 in 1992–1993, and has declined to a level of just above 30 in the past few years.

Figure 2. Global conflict incidence by type, 1946–2006



Source: Gleditsch and others (2002).

C. THEORETICAL FRAMEWORK

Resource scarcity is seen as a product of three different factors interacting—population growth, resource degradation, and the distribution of resources between individuals and groups. Homer-Dixon has called this *demand-induced*, *supply-induced* and *structural scarcity* respectively (Homer-Dixon and Blitt, 1998; Homer-Dixon, 1999). The distributional aspect is central in all the most influential frameworks of the resource scarcity tradition (Baechler, 1999; Homer-Dixon, 1999; Kahl, 2006). The three sources of scarcity may exert different impacts from case to case, and frequently interact. Homer-Dixon (1999) argues that two types of interactions are particularly common. *Resource capture* occurs in a situation of

resource degradation and population growth, providing incentives for powerful groups to take control over scarce resources on the expense of weaker and poorer groups. *Ecological marginalization* denotes a situation where great land inequality and population growth leads people to move into more ecologically fragile areas. While many countries have the ability to adapt to environmental change, some countries, particularly poor and institutionally weak States, are likely to be more vulnerable to environmentally related violence (Baechler, 1999, p. xvi; Homer-Dixon, 1999, p. 181). Resource scarcity arguably also has the potential to aggravate social segmentation (Homer-Dixon, 1999, p. 96). While demographic and environmental pressures are seen as unlikely causes of international wars, it is claimed that such factors may spur local violent low-intensity disputes (Baechler, 1999; Homer-Dixon, 1999; Kahl, 2006).

While, in the environmental security literature, it is generally agreed that the effects of resource scarcity depend on the political, economic and social structures in place, the role of political variables, especially regarding Government action, has not been sufficiently studied or added to theoretical models linking resource scarcity and conflict. Kahl (2006) has identified two alternative causal pathways from demography and environment to violent conflict. He identifies two distinct “State-centric” causal pathways from resource scarcity to internal violent conflict; the *State failure* and the *State exploitation* hypotheses. Both start from the premise that resource scarcity, or what he terms *demographic and environmental stress* (DES), may put severe pressure on both society at large and on State institutions. When the interaction between resource degradation, population growth and unequal resource distribution leads to lower per capita availability of land resources and the expansions into more marginal land, this is assumed to put a greater downward pressure on agricultural wages and contribute to economic marginalization as a first-order effect. Such hardship can, as a second-order effect, lead both to rural-to-rural migration, potentially causing inter-ethnic conflicts over land, and to rural-to-urban migration. While urban populations generally enjoy material standards above those in rural areas, rapid urbanization often puts pressure on the State’s ability to provide vital services such as housing, clean water and health services. Further, the social consequences of DES may produce absolute deprivation, meaning that people do not get what they need in order to survive, as well as relative deprivation, a situation in which they do not get what they feel they are entitled to. Both forms of deprivation may produce grievances among rural and urban populations.

The novelty in Kahl’s (2006) approach lies in the way in which he differentiates between the potential roles of the State. Like Homer-Dixon (1999), he sees DES as a factor that can produce severe strains on the State. DES is argued to potentially weaken a State’s *functional capacity* not only by placing costly demands on the State for development projects in the agricultural sector or social improvements for burgeoning urban populations, but also by generally undermining overall economic productivity and potentially the ability to finance a coercive capacity (Kahl, 2006, pp. 40-42). The other aspect of State strength, *social cohesion*, may also be weakened by DES. Alternatively, elites within the State may compete over how to use strained resources either geographical or sectoral, and they may disagree over the best way to respond to the challenges posed by DES (Kahl, 2006, p. 43).

The weakening of the State is seen as an intermediate factor between resource scarcity and violent conflict. While the resource scarcity literature is often seen as belonging to the “motive” tradition, the State-centric perspective identifies important opportunity factors in both possible causal trajectories. The State weakness hypothesis posits that the impact of resource scarcity will weaken State institutions and provide opportunities for potential rebel groups to challenge State authority. Conflict may arise when the potential gains from a rebellion are higher than the costs a State can inflict on the rebels. Waning State authority produces a “security dilemma” where social groups are “left to fend for themselves” (Kahl, 2006, p. 47). Episodes of regime collapse and regime transitions may thus provide great opportunities for DES-generated violent conflict. However, even when demographic and environmental factors are *not* the primary drivers of State failure, relatively weaker States are presumably more likely to experience resource-scarcity conflicts firstly, because they are less capable of mitigating the effects of resource

scarcity, and secondly because they are generally more likely to be militarily challenged by opposition groups. If the State failure hypothesis is an important pathway to armed conflict, statistical controls for low State capacity and State failure should capture some of the explanatory power of the demographic and environmental variables.

The State exploitation hypothesis suggests another important opportunity factor, namely, the opportunity for weakened States to bolster their support base through mobilizing ethnic groups to capture scarce resources. When regimes experience increased grievances and opposition due to resource scarcity, they may be likely to instigate interethnic violence as a means to divert attention from their inability to meet these demands at the same time as they consolidate support among groups that may capture resources at the expense of contending groups. While theoretically appealing, the State exploitation hypothesis is difficult to test empirically. Kahl (2006) posits that State exploitation “can occur at levels of State weakness far short of total collapse” (Kahl, 2006, p. 50), but he does not offer suggestions for what characteristics are expected to be seen among regimes that would engage in State exploitation. Therefore, while it may be possible to test whether domestic armed conflicts are overrepresented in resource scarce areas of poor countries, it may not be possible to conclude whether a statistical relationship between resource scarcity and conflict may be due to “State exploitation”, or not.

1. Critiques of the resource scarcity perspective

The major challenges to the resource scarcity perspective come from the three different traditions of neoclassical economics, political ecology and institutionalism. Neo-classical economists, also often referred to as cornucopians or resource optimists, have posed three different sets of arguments that challenge the view that resource scarcities are likely to cause armed conflict. First, they argue that the situation is not as bleak as portrayed in some of the environmental scarcity literature. Most renewable resources are not scarce at the global level, and markets, technological developments, and resource substitution are factors that are likely to help us adapt to situations of local scarcity (Maddox, 1972; Lomborg, 2001). Furthermore, in virtually all areas of the world, people are responding to lower mortality by reducing their fertility, albeit at different speeds. Within the next 60 to 70 years world population growth is likely to come to an end (Lutz and others, 2004).

A second argument is that high population pressure and resource scarcity may be a vehicle for development. High population growth and increasing scarcity of resources provide incentives for people to search for ways to mitigate scarcity by means of technological development and resource substitution (see, for instance, Boserup and Schultz, 1990; Simon, 1989). Hence, a high population pressure will eventually lead to less resource dependence and decreasing problems of scarcity. Boserup holds that the historically low level of population pressure in sub-Saharan Africa is one important factor behind the continent’s low agricultural effectiveness and underdevelopment (Boserup and Schultz, 1990). Furthermore, countries with high population densities are likely to have more effective production systems because larger-scale investments in infrastructure imply lower per capita costs, also in these countries there is generally greater availability of human resources in any geographical area or location.

The third neoclassical argument is that resource abundance causes conflict, not scarcity. This claim has two different bases. First, the honey-pot hypothesis contend that the availability of high-value natural resources like diamonds, gemstones, oil, other valuable minerals or tropical timber may motivate certain groups to capture the resources either as a way to enrich themselves or as a means to finance conflict activities. Second, resource abundance may work indirectly by weakening State institutions. Resource-based rents may lead to the crowding out of other sectors of economic production, known as the “Dutch disease”, to economic stagnation and to corruption. “Rentier States” may also use rent resources to quell dissatisfactions and hence avoid demands for structural reforms and democratization.

While there is much empirical research pointing to a relationship between resource abundance and conflict (see, for example, Collier, 2000; LeBillon, 2001; de Soysa, 2002; Lujala and others, 2005), the scarcity and abundance perspectives are by no means theoretically exclusive, although often portrayed as competing hypothesis. Renner (2002) argues that they may sometimes be complimentary, as resource extraction can lead to the degradation of renewable resources. The first two arguments challenge the assumptions of the resource scarcity perspective more directly. The argument that renewable resources are not globally scarce and that markets, technological innovations and demographic adaptation may mute local scarcities is not entirely rejected by scholars associated with the resource scarcity perspective. In fact, Homer-Dixon acknowledges that what he terms “technical and social ingenuity” is likely to help many societies overcome resource scarcities (Homer-Dixon, 1999, p. 108). However, in many developing countries, markets, property rights, government structures, infrastructure and human capital “are imperfect, absent altogether, or distorted in ways that actually compound resource problems” (Kahl, 2006, p. 17), which widens the “ingenuity gap” (Homer-Dixon, 1999, p. 108; Homer-Dixon, 2000). Hence, resource scarcity is more likely to cause conflict where adaptation mechanisms are particularly weak, particularly in regions within countries with weak State penetration. Similarly, the argument posed by Boserup and Simon does not necessarily contradict the resource scarcity perspective; it may primarily speak to different temporal effects. The long-term consequences of population pressure in the form of high population densities may very well be greater adaptive capacity and peace. But scarcities of renewable resources, which both Boserup and Simon see as a consequence of population growth, can still be a source of conflict in the short run.

The second tradition challenging the resource scarcity perspective, political ecology, sees resource distribution as the main mediating factor between the environment and conflict. Political ecology, with roots in Marxian political economy, sees scarcity primarily as a product of local and international structures of power and wealth, and downplays “natural” sources of scarcity like population growth and degradation. Political ecology “provides tools for thinking about the conflicts and struggles engendered by the forms of access to and control over resources” (Peluso and Watts, 2001, p. 25). While political ecologists argue that local cases of “scarcity” may very well happen in the context of local abundance, they also argue that the resource scarcity perspective mostly ignores what they see as the most important sources of resource degradation, namely resource extraction like mining and logging, dam construction and other forms of industrial activity (Peluso and Watts, 2001, p. 26).

Implicit in the critique from political ecologists is a claim that proponents of the resource scarcity perspective are blaming the poor for causing scarcity and violence. Under the heading “localizing blame,” Hartmann (2001) criticizes Homer-Dixon for failing to acknowledge the role of economic and political factors that create structures of exploitation (Hartmann, 2001, p. 50). Arguing that Homer-Dixon is primarily focusing on internal stresses that create outward pressures, she claims that “the outside is rarely seen to be pressing in” (Ibid.). Commenting on scarcity and violence in Ogoniland, Nigeria, Hartmann asks why Homer-Dixon focuses “on the violence of local acts of resistance and not on the much larger violence of State and corporate enforcers” (Hartmann, 2001, p. 60)? Also claimed to be missing from the picture are “the consumers of the extracted products” –for instance, consumers of paper in developed countries playing a major role in the deforestation of developing countries (Hartmann, 2001, p. 61).

While it is true that Homer-Dixon’s case studies mainly address local violent responses, external factors and resource distribution are not absent from the analysis. The expansion of the ranching industry and neo-liberal economic reforms play an important role in the analysis of the Chiapas conflict (Howard and Homer-Dixon, 1998), the Israeli occupation is seen as an important cause of water scarcity and economic stagnation in Gaza (Kelly and Homer-Dixon, 1998), and the political economy of apartheid is considered the main driver behind resource scarcity in South African “homelands” (Percival and Homer-Dixon, 1998). Resource distribution plays a major role in many of Homer-Dixon’s cases, and for this reason he has been criticized for diluting the concept of resource scarcity (see, for example, Gleditsch and

Urdal, 2002). In Chiapas, Mexico, Gaza and South Africa, the major problem appears to be resource distribution, not lack of renewable resources per se. But population growth and resource degradation may play an aggravating role, a fact often overlooked by political ecologists.

Finally, the resource scarcity perspective has been challenged by “institutionalists,” claiming that scarcity is more likely to lead to cooperation over resource management than conflict (see, for instance, Wolf, 1999; Wolf and others, 2005). Armed conflicts are costly, and fighting over renewable resources rarely pays. Rivalry over access to resources may instead provide opportunities for neighboring groups or States to enter into a dialogue over institutional arrangements for resource sharing. Cooperation over resource management may further lead to cooperation in non-resource related areas through trust-building and development of institutional capital. Cooperation over resources can exist even in the context of violent conflict, such as water sharing agreements between Palestinians and Israelis, and it can follow cyclical trends, with cooperation happening primarily during periods of scarcity. While much of the focus has been on water agreements, for which there were twice as many cooperative events as conflictual in the 1945-1999 period (Wolf and others, 2005, p. 81), the concept of “environmental peacemaking” extends much further, including, for instance, the establishment of “peace parks” (Conca and others, 2005). Meier and others, (2007) have found some local-level support for cyclical patterns of conflict and cooperation linked to rainfall.

2. Previous studies

Previous quantitative studies have found mixed evidence for the resource scarcity and conflict nexus. The two larger studies in the field, the State Failure Task Force Report (Esty and others, 1998) and Hauge and Ellingsen (1998) reported slightly different results. Esty and others, found no effects of soil degradation, deforestation and freshwater supply on the risk of State failure. Hauge and Ellingsen (1998), on the contrary, concluded that the same environmental problems as well as high population density were indeed positively associated with civil war, but that the magnitude of the effects was secondary to political and economic factors. However, Hauge and Ellingsen’s results have, for unknown reasons, proven not to be replicable even with the assistance of the authors, and are also not reproduced in an analysis of extended time-series resource scarcity data (Theisen, 2008). In a study of Sub-Saharan African countries 1981-1999, Hendrix and Glaser (2007) found that water scarcity decreased the risk of conflict, while deviations in rainfall were associated with higher conflict risks. Also Miguel and others, (2004) report higher conflict risks associated with rainfall deviations in Sub-Saharan Africa, while de Soysa (2002a) found no relationship between conflict and a composite measure of renewable resource scarcity. Assessing the issue of land scarcity, de Soysa (2002b) found a significant effect of population density on domestic armed conflict. Quantitative studies on population and internal armed conflict are summarized in Appendix A.

D. THREE EMPIRICAL STUDIES ON POPULATION AND ARMED CONFLICT

1. Global cross-national effects of population pressure 1950-2000

Do countries differ in their conflict propensities as a result of their overall population pressure on renewable resources? In an article published in the *Journal of Peace Research*, Urdal (2005) studied the relationship between population growth and per capita availability of potentially productive land on the one hand, and the onset of internal armed conflict on the other. While some case studies linking environmental factors and political violence address local environmental issues and disputes, many also focus on the country level. Arguably, the State is a highly relevant political unit in the study of the environment-conflict nexus, as local resource scarcity within a country may be ameliorated by better

resource management, resource transfers or population movements. Hence, local resource scarcity in an overall resource abundant country may be seen as governance failure. If so, local conflict over scarce resources is a product of government actions or inactions, rather than of scarcity per se.

The unit of analysis is the country-year, and the dependent variable is the onset of an internal armed conflict, taken from the PRIO–Uppsala dataset (Gleditsch and others, 2002). The study includes all sovereign States and all politically dependent areas (colonies, occupied territories, and dependencies) for the 1950–2000 period, and it applies a standard logistic regression analysis. An armed conflict onset is consequently coded 1 for the first year of a domestic conflict. Subsequent years in conflict (including new conflict onsets when a previous conflict is still active) as well as years in peace are coded 0.

Population data are taken primarily from the *World Population Prospects, The 1998 Revision* (United Nations, 1999). *Population density*, or *potential cropland*, is defined as total population relative to all of a country’s land that fall into the following land use categories: arable land, permanent crops, permanent pastures, and forests and woodlands. Land that is excluded from this definition includes, but is not limited to, urban areas, mountains, roads, and deserts. The population density variable is log-transformed in order to reduce the huge variation. Control variables include level of development, proxied by the infant mortality rate (IMR), regime type, economic growth, total population size and previous conflict (for exact references and operationalizations see Urdal, 2005).

The results of the study (see table 1 for the basic models) indicate that national-level aggregate demographic pressures are not strongly related to armed conflict. The interaction between population growth and density is not robustly associated with the onset of an armed conflict. In fact, in countries with negligible population growth, high population densities seem to lower risk of conflict somewhat. Nor are urban growth rates statistically associated with conflict onset. However, when considering the relationships between population pressure and conflict over time, the interaction of population growth and density was found to be clearly associated with an increased risk of conflict in the 1970s (for all models see Urdal, 2005). Also, the frequent claim that resource scarcity has become more pertinent as a driver of armed conflict in the post-Cold War era receives no support. In fact, urban growth is statistically associated with lower risk of conflict onset in this period (table 1).

TABLE 1 – RISK OF ARMED CONFLICT BY POPULATION PRESSURE VARIABLES

DEPENDENT VARIABLE: ONSET OF INTERNAL ARMED CONFLICT

<i>Independent variables</i>	<i>Basic Model</i>	<i>Expanded Model</i>	<i>Post-Cold War</i>
Population growth	Not significant	Not significant	Not significant
Population density	Positive (weak)	Not significant	Not significant
Growth x density	Not significant	Not significant	Not significant
Urban growth		Not significant	Negative

Source: Urdal (2005).

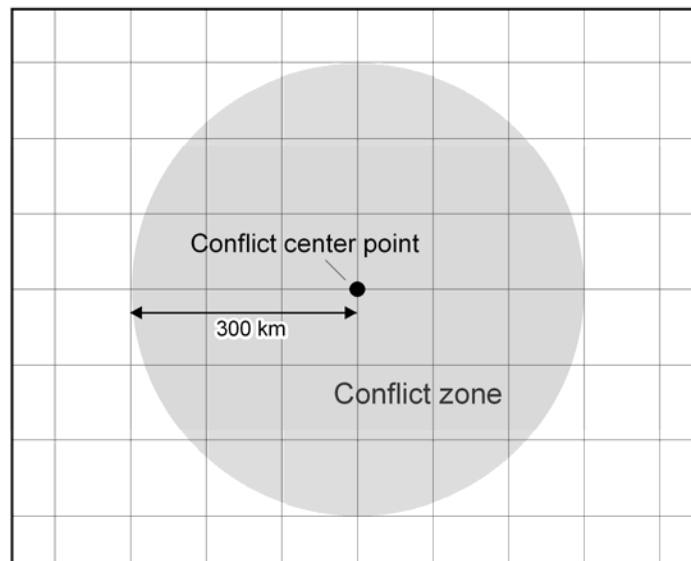
NOTES – Logit model for conflict onset. Results for control variables not shown here. “Positive” refers to a statistically significant positive relationship between the independent variable and the dependent variable, “Negative” refers to a statistically significant negative relationship between the independent variable and the dependent variable.

2. A global sub-national study of population and environmental pressures

Raleigh and Urdal (2007) investigate whether, at the local level, demographic and environmental factors determine the location of armed conflict. The coverage is global, but the units of analysis are geographical squares of 100x100 km at the equator. In particular, the authors investigate whether stressors will presumably become more common as a consequence of global warming. The study addresses three different demographic and environmental concerns, population pressure, land degradation and water scarcity, and departs from the assumption that high population density, degradation and water scarcity should be more strongly associated with conflict in areas with increasing population pressure. For this sub-national study, data are created from geospatial information. The dataset has three main differences as compared to typical county-year analyses: the unit of observation is considerably smaller; the dependent variable is assigned to a particular location and associated with values from that location; and independent variables are derived from a geospatial dataset, including shape and raster files. A shape file spatially describes geometries such as points, lines or polygons. Raster graphics are digital images created or captured (for example, by scanning in a photo) as a set of samples of a given space¹.

The data cover all countries with populations over 100,000, and the full dataset is comprised of 13,199 polygon squares. The study is limited to the civil conflicts observed from 1990 to 2004 as the geospatial explanatory variables used were collected during or after 1990. The Uppsala/PRIO location information is an aggregate measure of the center of the larger conflict, so the actual location of the fighting is not directly represented (see Buhaug and Gates, 2002). A radius of 300 km from the conflict point was chosen, assuming that this would properly denote a “conflict zone” and therefore account for the majority of definite fighting locations. All 585 conflict point coordinates are automatically assigned a radius of 300 km, resulting in 1,907 conflict squares. Figure 3 displays a hypothetical conflict zone set upon grid square.

Figure 3. Conflict zones upon grid squares



¹ For a description of the creation of the dataset, see Buhaug and Rød (2006) and Raleigh and Urdal (2007).

The *Human Induced Soil Degradation* indicator was produced as a result of an initiative of the International Soil Reference and Information Centre (ISRIC) and the United Nations Environment Programme (UNEP) in 1990. The information on soil degradation is based on questionnaire responses from numerous soil experts throughout the world. Each measure combines type, degree, extent, cause and rate of soil degradation, recoded into a set of four dummy variables indicating no or very low, low, medium to high or very high level of degradation. *Easily Available Fresh Water* measures the amount of stored soil moisture easily available to crops, and the variable is coded into five different categories of very high, high, medium, and low access to available water, and finally dry land. Geo-referenced data on *population density* from The Center for International Earth Science Information Network (CIESIN) provides population measures from two points in time (1990 and 1995) at a 1 km level. Population count of people per square kilometer is represented as an increasing density score (see Appendix 1 in Raleigh and Urdal, 2007). Differences between the 1995 and 1990 estimates determined population growth during this time. All three variables are also interacted with population growth to assess whether areas of high population or environmental pressures are particularly susceptible to conflict when population growth is high. Control was further made for country level GDP per capita and regime type, political instability and direction of political change. The analysis method is ordinal logistic regression, where the dependent variable is conflict and the unit of observation is the grid square.

Table 2 summarizes the main findings from the article (for all results see Raleigh and Urdal, 2007). For the full global sample, robust effects on conflict of the interactions between population growth and density, as well as population growth and water scarcity were found. No empirical support for any mediating effects of the proxies used to measure State capacity or governance was found (measured by GDP per capita and democracy levels respectively, results not shown in Table 2). When looking exclusively at the poorer half of the globe, which presumably should be more susceptible to conflict generated by demographic and environmental factors, consistent and robust effect of the interaction between population growth and density was found. Again, the assumed mediating effect of State capacity and governance is not captured by the empirical model. The positive effects of environmental degradation in the high-income segment seem to be driven by a handful of states that experienced armed conflict in the period covered (Russian Federation, Iraq, Serbia, Mexico, Spain). The results are extremely sensitive to country omissions. If the Russian Federation is omitted from the high-income models, low and medium degradation as well as water scarcity become clearly insignificant, and interaction terms remain non-significant. The positive influence of high degradation is driven by twenty-nine high degradation squares in Iraq, Serbia and Mexico. Further, if either Spain or Mexico is omitted, the water scarcity variable becomes non-significant. Because of the relatively low conflict prevalence in the high income segment—only 5 per cent of the squares in the high-income sample experienced conflict compared to 24 per cent for the low-income sample—the results for this segment are more susceptible to the influence of a few conflict cases with high levels of resource scarcity. While resource scarcity has been argued to be causally related to conflict in the case of Chiapas, Mexico, combined with land inequalities and high population pressure (Howard and Homer-Dixon, 1998), it does not appear to be an important cause of conflict in the other cases mentioned.

TABLE 2. DEMOGRAPHIC AND ENVIRONMENTAL STRESS FACTORS AND INTERNAL ARMED CONFLICT:
RELATIVE RISK OF CONFLICT INCIDENCE BY INCOME LEVEL

<i>Stress factors</i>	LEVEL OF INCOME	
	<i>High</i>	<i>Low</i>
Low degradation	Positive	Negative
Medium degradation	Positive	Not significant
Very high degradation	Positive	Not significant
Water scarcity	Positive	Positive (weak)
Population density	Positive	Positive
Population growth	Positive	Positive
Pop growth *density	Not significant	Positive
Pop growth *water scarcity	Not significant	Positive (weak)
Pop growth * degradation	Not significant	Not significant

Source: Raleigh and Urdal (2007).

NOTE: Logit model for conflict incidence. The results for control variables are not shown here. The reference category for degradation is “no or very low degradation”. “Positive” refers to a statistically significant positive relationship between the independent variable and the dependent variable, “Negative” refers to a statistically significant negative relationship between the independent variable and the dependent variable.

It is clear that the impact of population growth is mediated by other variables, most notably population density. At the highest levels of both, the risk of conflict more than doubles compared to squares with the lowest levels of population growth and density. Apparently, the interaction between population growth and high levels of water scarcity is also significantly and positively associated with conflict. However, this result, along with other demographic and environmental results for this model, should be considered with two caveats: grid squares in Niger are driving the result between water scarcity and population growth; its omission from the model renders this interaction clearly statistically insignificant. Furthermore, although the additional risk from population growth interacting with environmental variables varies from insignificant to pronounced, squares with the combination of high population growth and the highest levels of degradation, scarcity and density are unlikely or rare occurrences, calling for considerable caution when interpreting the results.

It remains that all sample models for low-income countries show very consistent results despite the gradual inclusion of interaction terms and control variables. Both population growth interacted with water availability as well as population growth interacted with population density are consistently associated with an increasing risk of conflict, while the traditional national-level variables such as GDP, political institutions and the sub-national population density account for a considerable amount of conflict across States. The inclusion of economic and political control variables do not alter the impact of any of the demographic and environmental variables. This runs counter to the expectation that State weakness variables would capture some of the variance explained by resource scarcity variables. For all intents and purposes, models on the low-income sub-sample speak to the relative insignificance of demographic and environmental pressures for conflict behavior in those areas that should, according to the resource scarcity perspective, experience the most pronounced effects.

3. A sub-national study of India

An alternative disaggregated approach is to study whether variations in demographic and environmental factors are associated with variations in levels of political violence within one State, implicitly controlling for type and strength of government. Urdal (2008) addresses the relationships between demography, environment and political violence in 27 States in India from 1956 to 2002. A great advantage of such design is the availability of relevant data that are comparable over time and space. Data from Indian censuses and other regular national surveys allow for cross-sectional time-series comparison due to highly similar methods and procedures for the collection and dissemination of information. The detailed and diverse data provide better opportunities for testing more specific hypotheses derived from the literature on demography and conflict.

There are three different and independently collected measures of political violence analyzed in the study. Data on *internal armed conflict* is based on the PRIO/Uppsala dataset (Gleditsch and others, 2002). The second data source is a count measure of *political violence events* collected from news sources covering the 1960 to 2000 period (Marshall, 2001), and the violence indicator is a count measure of *Hindu-Muslim riots* (Varshney and Wilkinson, 2004). Demographic explanatory variables are based on data from Indian census publications, and data on rural and urban income inequality (measured by GINI coefficients) and poverty (measured as percentage living below the national poverty line), as well as agricultural wages originating from a World Bank project on poverty in India (Özler and others, 1996). Summaries of the main findings are provided in table 3 (for all results see Urdal, 2008).

The results generally provide more support for the resource scarcity and conflict scenario than cross-national studies. Scarcity of productive rural land is associated with higher risks of political violence, particularly when interacting with high rural population growth and low agricultural yield. High growth in agricultural wages is associated with a lower risk of armed conflict. But other central aspects of the resource scarcity scenario are not supported. Structural scarcity (measured by rural inequality) and high urbanization rates do not increase the risk of political violence. Hindu-Muslim riots, a predominantly urban phenomenon, do not seem to be related to population pressure, not even to high urbanization rates.

TABLE 3. POPULATION, RESOURCES AND ARMED CONFLICT IN INDIA, 1956-2002

PROBABILITY OF OCCURRENCE OF ARMED CONFLICT, POLITICAL VIOLENT EVENTS AND RIOTS

<i>Independent variables</i>	<i>Armed conflict</i>	<i>Political violence</i>	<i>Riots</i>
Rural pop growth	Not significant	Not significant	Not significant
Rural pop density	Positive	Not significant	Not significant
Rural growth *density	Not significant	Positive	Not significant
Urban growth	Negative	Not significant	Not significant
Rural inequality	Not significant	Not significant	Not significant
Agricultural yield	Not significant	Positive if high density	Not significant
Decline in agricultural wages	Positive (long-term decline)	Not significant	Not significant

Source: Urdal, 2008

NOTE: Logit model for armed conflict incidence, event count models (negative binomial regressions) were used to analyze the political violent events and riot events data. The results for the control variables are not shown here. "Positive" refers to a statistically

significant positive relationship between the independent variable and the dependent variable, “Negative” refers to a statistically significant negative relationship between the independent variable and the dependent variable. For all results, see Urdal (2008).

E. SUMMARY

This paper has provided a systematic review of recent research on the relationship between demographic factors and internal armed conflict that goes beyond the extensive case-study literature on the topic. The principal research question was whether countries that experience demographic pressures are generally at a higher risk of experiencing armed conflict and other forms of political violence. In order to try to answer this question, a set of statistical studies at the cross-national, national and local levels were conducted by the author (see Appendix A for a summary of these and previous studies).

A main conclusion from the project is that high levels of population growth and high ratios of population to productive land do *not* make countries more susceptible to armed conflict. Furthermore, there is no indication that the conflict proneness of poor countries results from greater population pressure on natural resources. These findings resonate well with previous cross-national studies that have found little support for the resource scarcity perspective. In addition, there seems to be little reason to fear that the rapid and massive urbanization that is currently witnessed in many developing countries is something that generally will lead to destabilization and armed conflict. Hence, security does not appear to be a valid rationale for reducing global population growth or the speed of urbanization.

A second main conclusion is that the geographically disaggregated studies provide greater support for the relationship between population pressure on natural resources and conflict than the cross-national studies, albeit with some important qualifications. These findings suggest that environmental scarcity and conflict relationships should be studied at the local level. The combined findings of cross-national and disaggregated studies indicate that while overall demographic pressures and resource scarcity do not seem to make a State conflict prone, the internal distribution and management of resources seem to contribute to or explain the geographical distribution of political violence. In other words, relative regional differences in access to natural resources seem to impact the risk of conflict, even in the absence of any “absolute” scarcity in the country as a whole. While it may be argued that this result is in accordance with the distributional aspect of the resource scarcity argument, it is notable that structural inequalities among rural people and groups internal to Indian States do not appear to affect the risk of political violence. This observation may be compatible with a centre-periphery motive approach, whereby groups in relative resource-scarce regions may be more likely to challenge the State governments. But it may also be compatible with the opportunity perspective, to the extent that resource scarcity leads to lower opportunity costs of engaging potential rebel recruits, especially in areas that have low wages or high unemployment rates. Furthermore, the relationship between regional resource scarcity and conflict may be seen as originating in the lack of ability or willingness by central governments to address relative resource scarcity, in the inability of regional and local governments to adopt measures to reduce resource scarcity, or in low adaptability and mobility of people from certain regions.

Two caveats should be added to the conclusions about the impact of population pressure as a factor of resource scarcity and conflict. The first is that the detailed test of propositions regarding the Indian States derived from the resource scarcity perspective cannot be reproduced for a global sample of States. Comparable data on rural land availability, rural and urban inequalities, agricultural productivity and growth in agricultural wages are not widely available across countries and over time periods. Hence, there is a possibility that the discrepancies in results may be a consequence of the inability to test more detailed aspects of the resource scarcity hypothesis globally. The other caveat relates to the data availability for geographical squares. There is no established standard methodology in this field, and data are not available for very long time-series. Hence, caution should be taken when interpreting the results.

The most robust finding in support of the resource scarcity perspective is the interaction between high population growth and density. However, it is not yet possible to empirically assess whether the result is driven by urbanization, growth in populous agrarian areas, or intra-rural or cross-border migration. Ongoing efforts to collect comparable time-series data on population and environment will eventually provide opportunities for better tests of the resource scarcity perspective. Future studies of regional or local population pressure and political violence will show whether the results obtained in the India study can be replicated for other political contexts. As more data become available, more detailed studies using geographical units of analysis could shed more light on the regional and local population-conflict nexus. In particular, longer time-series of demographic and environmental data, as well as geo-referenced data on ethnicity, poverty and State penetration may provide more detailed insights. Substantively, the issue of migration should be prioritized. A recent global study suggests that conflict-related refugee movements play a role in the diffusion of conflict (see, for example, Salehyan and Gleditsch, 2006), but migrants responding to environmental change may not necessarily pose a similar threat (Gleditsch and others, 2007). The development of better data may provide opportunities to test more specific hypotheses on the relationship between migration and political violence at the sub-national level. Finally, the discrepancy in findings between the effects of scarcity at the State and sub-State levels calls for more detailed case studies of sub-national areas that have peacefully succeeded in addressing high levels of population pressure and resource scarcity. Such studies will help determine to what extent adaptation and coping is facilitated by the State, by local and regional governments, or by the local population itself.

NOTE

¹ South Asia includes Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

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APPENDIX A:

SUMMARY OF QUANTITATIVE STUDIES ON POPULATION AND INTERNAL ARMED CONFLICT

Variables	Cross-national studies	Sub-national studies
Population density, growth, and their interaction	<p>Hauge and Ellingsen (1998), de Soysa (2002): positive effect of population density.</p> <p>Collier and Hoeffler (1998; 2004), Esty and others. (1998), Hegre and Sambanis (2006), Theisen (2008), Urdal (2005): no effect of population density.</p> <p>Urdal (2005): no effect of the interaction of high population density and growth, except positive for the 1970-79 period.</p>	<p>Buhaug and Rød (2006): no effect of population density for sub-Saharan Africa.</p> <p>Raleigh and Urdal (2007): a positive effect of density and growth combined, for low-income countries only.</p> <p>Urdal (2008): High rural population density is associated with a higher risk of armed conflict, and high rural density and population growth combined with increasing levels of violent political events. Rural population pressure is unrelated to Hindu-Muslim riots</p>
Secondary Effects: Rural inequality, agricultural productivity and growth rates of agricultural wages	Not previously tested in cross-national studies	Urdal (2008): No effect of rural inequality, some effect of low agricultural yield and declining agricultural wages
High urban population growth	Urdal (2005): no effect, except negative for the post-Cold War period.	Urdal (2008): Urban growth negatively affects the risk of armed conflict, unrelated to other forms of political violence

Part Five
Urbanization, health and poverty

THE HEALTH OF URBAN POPULATIONS IN DEVELOPING COUNTRIES

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A. INTRODUCTION

Within the next two to three decades, the populations of poor countries will cross an historic threshold, becoming for the first time more urban than rural (United Nations, 2008). This transformation of the demographic landscape will have profound implications for health, affecting not only service delivery but also the nature of the risks facing what will be predominantly urban populations. As we approach this historical moment, it is important to set aside the thinking that have prevented the health needs of city-dwellers from being fully appreciated, whether by developing country policymakers or by the international institutions that assist them. Perhaps the most urgent need is to recognize the social and economic diversity of urban populations, within which can be found large groups of the poor facing health risks that differ little from those of rural villagers. It is not incorrect to say that, on average, urbanites enjoy an advantage in health relative to rural dwellers, but health policies for an urbanizing era cannot be based on averages alone. Disaggregation is essential if policies are to be properly formed and programmes targeted to those in need.

There are several dimensions that require consideration. As just mentioned, to see the urban health situation clearly, the situations of the poor and near-poor must be distinguished from those of other urban residents. In what follows, we document the within-urban differences in health for a number of developing countries, and show how the risks facing the urban poor compare with those facing rural villagers. But still further disaggregation is in order. Among the urban poor, some live in communities of concentrated disadvantage—*slums*, in the usual shorthand—where they are subjected to a daily barrage of health threats, but other poor urbanites are dispersed among a variety of neighbourhoods.¹ Geographic targeting might well be an effective health strategy for reaching slum-dwellers, but other approaches will need to be devised for the urban poor who live outside the slums.

The supply side of the urban health system is as diverse as the urban population. Even a medium-sized city will present a full array of health providers, ranging from traditional healers and sellers of drugs in street markets to highly trained surgeons. Many of these providers are likely to be engaged in private practice, either on a full-time or part-time basis and for this reason urban health care is more monetized than rural care. However, the imposition of fees for service in the urban system does not imply that the services rendered are of acceptable quality. Recent studies on the quality of care provided to the urban poor reveal that the poor who are able to pay for health care receive little in return for their fees—the care delivered by both private- and public-sector health providers can be grossly inadequate. Although the physical distance to services is less than in rural areas, and modern health-care providers would seem to be near at hand, the urban poor may be unable to pay for such care or be assured of minimally acceptable quality when they can pay.

In addition to the socioeconomic and supply-side differences existing within any given city, there are important differences across cities that need to be considered. Small cities and towns house the vast majority of developing-country urban residents (United Nations, 2008; Montgomery, 2008a). A number of studies suggest that rates of poverty in these smaller settlements often exceed poverty rates in larger cities, and it can be shown that in many developing countries, small-city residents are more likely to lack adequate drinking water and sanitation (Panel on Urban Population Dynamics, 2003). Also, shortages of

health personnel and services plague many small cities, leaving them in much the same situation as rural areas.² As developing countries engage in health sector reforms and continue to decentralize their political and bureaucratic systems, allowances will need to be made for the generally thinner resources and weaker capabilities of the small cities and towns (Panel on Urban Population Dynamics, 2003).

To convey the scale of the urban health challenge that lies ahead, Sections B and C summarize the urban health differentials that can be identified in data from internationally-comparable sample surveys. The approach is to disaggregate urban and rural populations according to a standard of living index specific to each sector, and then to document urban-rural and urban-specific inequalities in health. Section D focuses attention on the supply side of urban health, with particular emphasis on the money costs and quality of health care. In Section E, we turn to a description of urban health risks that have not been sufficiently appreciated and to be effectively dealt with, would require an unusually expansive conception of the role of the public health system. Section F concludes the study.

B. THE URBAN BURDEN OF DISEASE: OVERVIEW

To bring some order to what will be a wide-ranging discussion; we begin with an overview of urban causes of death and disability, drawing on data from Mexico, one of the few low- and middle-income countries that can provide reliable cause-specific information. Table 1 shows the 15 leading causes of disability-adjusted life years (DALYs) lost in Mexico's rural and urban areas. Several lessons can be extracted from this table. First, urban areas do not necessarily present health profiles that are wholly distinct from those of rural areas. In Mexico, the causes of DALYs lost are much the same in urban and rural areas. Of the top 5 causes in Mexico's cities and towns, three (deaths related to motor vehicles, homicide and violence, and cirrhosis) are also among the top five in rural areas. Second, violence and traffic-related deaths and injuries are two of the most important causes of death and disability in urban Mexico, but in many countries these risks would be considered outside the scope of the public health system. Third, the table reminds us that even in a middle-income country such as Mexico, diarrhoeal disease and pneumonia continue to be important causes of urban death and disability.

TABLE 1 DISABILITY-ADJUSTED YEARS OF LIFE LOST IN MEXICO BY CAUSE AND RESIDENCE. 1991 ESTIMATES, EXPRESSED PER 1000 POPULATION

<i>Cause</i>	<i>Rural</i>	<i>Rural Rank</i>	<i>Urban</i>	<i>Urban Rank</i>	<i>Rural/Urban</i>
Diarrhoea	12.0	1	2.8	9	4.28
Pneumonia	9.3	2	3.9	7	2.39
Homicide and Violence	9.2	3	7.4	2	1.23
Motor Vehicle-Related Deaths	7.9	4	8.3	1	0.95
Cirrhosis	7.5	5	6.3	4	1.19
Anaemia and Malnutrition	6.8	6	2.4	11	2.86
Road Traffic Accidents	5.5	7	6.8	3	0.81
Ischemic Heart Disease	5.1	8	5.3	6	0.96
Diseases of the Digestive System	4.7	9	1.7	15	2.74
Diabetes Mellitus	4.1	10	5.7	5	0.72
Brain Vascular Disease	3.0	11	3.0	8	1.02
Alcoholic Dependence	3.0	11	1.9	13	1.56
Accidents (falls)	2.8	13	2.6	10	1.09
Chronic Lung Disease	2.6	14	1.9	13	1.39
Nephritis	2.2	15	2.2	12	1.01

Source: Lozano and others, (1999, p. 130).

C. AVERAGES AND INEQUALITIES IN URBAN AND RURAL HEALTH

It is commonly believed that in modern-day populations, rural levels of health are worse than urban, and this belief is supported by good scientific evidence. In its analysis of 90 surveys from the Demographic and Health Surveys programme, the Panel on Urban Population Dynamics (2003) found that, on average, the urban populations of poor countries exhibit lower levels of child mortality than rural populations, and similar urban–rural differences were evident across a range of health indicators. HIV/AIDS presents the large exception to the general rule of urban health advantage. Apart from HIV/AIDS, however, in most low- and middle-income countries, the urban advantage in terms of average health levels is too well-documented to dispute.

But averages can be a misleading basis on which to set health priorities. Upon disaggregation, urban health averages can be shown to mask wide socioeconomic differentials, and when these are examined, the urban poor are often discovered to face health risks that are nearly as bad as those of rural villagers and are sometimes unambiguously worse. In some studies of slum neighbourhoods, the health risks confronting this group of the urban poor have been found to exceed rural risks, despite the urban advantages conferred by the proximity of modern health services. Although less is known on a systematic basis about health differences across cities, it is clearly important to take account of differences in health institutions and personnel, and in the strength of oversight and management exercised by municipal and other tiers of government.

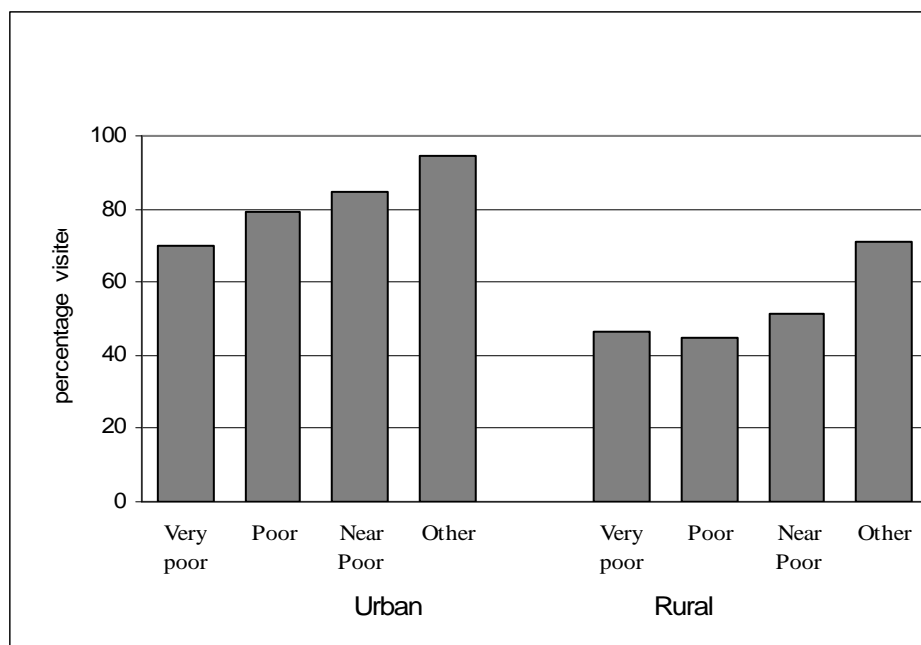
At present, very few developing countries can supply the detailed data needed to explore these important distinctions. Many countries have conducted nationally-representative health surveys, which allow a country's urban poor to be studied as a group, but do not often provide reliable estimates of health among the poor in any given city, or say nothing of health conditions among slum-dwellers. In addition, as explained by the Panel on Urban Population Dynamics (2003), the major international survey programmes focusing on health—the Demographic and Health Surveys (DHSs) and the Multiple Indicator Cluster Surveys (MICS)—have not generally provided sufficient locational information to identify residence in small- and medium-sized cities, and the city-size dimension of health is consequently more difficult to document than might have been thought. Finally, the surveys in these programmes do not gather information on income or consumption expenditures, and measures of living standards must therefore be based on proxy variables.

In what follows, a factor-analytic statistical method is applied to a set of such proxy variables in order to develop two rankings of relative standards of living:

- An urban household is classified as *very poor* if it is in the bottom 10 per cent of the urban distribution in the survey; declared *poor* if it is in the 11th–25th percentiles; *near-poor* if in the 26th–50th percentile range; and *other* if in the top half of urban households.
- A rural household is similarly ranked relative to other rural households.

The ranking is based on proxies for consumption (ownership of various consumer durables), together with producer durables and the age and education of the household head. The method is explained in detail in Montgomery and Hewett (2005).

Figure 1. Any prenatal care: urban and rural India (1998-2000)



Source: Author's calculations using Demographic and Health Surveys data.

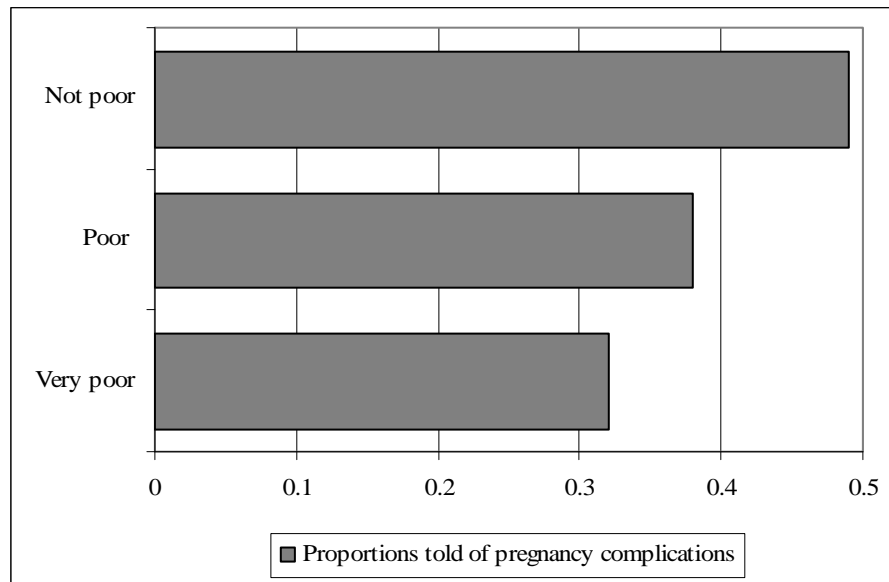
The essence of the results can be appreciated by considering the following small gallery of images in which, for a given health condition or service, the urban and rural populations are compared side-by-side¹. To begin, consider in figure 1 a basic measure of reproductive health, whether a pregnant woman made at least one visit for prenatal care, as recorded in the 1998–2000 Demographic and Health Survey for India. As can be seen, the percentages receiving care are notably higher for urban women than for rural, but within each sector, there are large differences evident by relative standards of living. (Recall that rural households are ranked relative to each other, and urban households also ranked in relation to other urban households). Only 69.7 per cent of very poor urban women in India receive any prenatal care—this is not much different from the percentage for rural women in the top half of the rural living standards distribution.

A sense of the quality of urban prenatal care can be gleaned from figure 2, also for India (Islam and others, 2006). This figure depicts the percentage of women whose prenatal care included discussion of pregnancy complications (among those receiving prenatal care). Only about a third of very poor urban women could recall any such discussion during their prenatal care visits—and yet it is difficult to imagine what information could be more urgently needed than this.

A similar picture emerges at the time of childbirth, when, as figure 3 shows for urban and rural India, there are enormous differences in the likelihood that a poor urban woman will have her delivery overseen by a physician or trained nurse-midwife, in comparison with better-off urban women. Obviously, differences within urban areas cannot be wholly attributed to shortages of health personnel, although that may be part of the reason why the urban–rural differences in birth attendance are as large as they are.

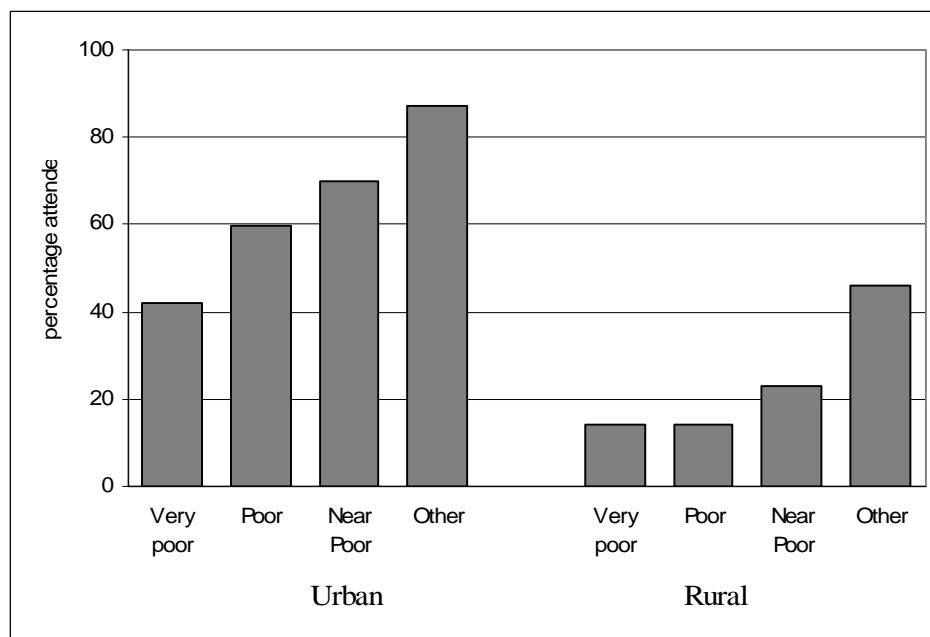
¹ A systematic summary based on all DHS surveys from 2000 is available in Panel on Urban Population Dynamics (2003).

Figure 2. Quality of prenatal care in urban India (1998-2000)



Source: Islam and others (2006).

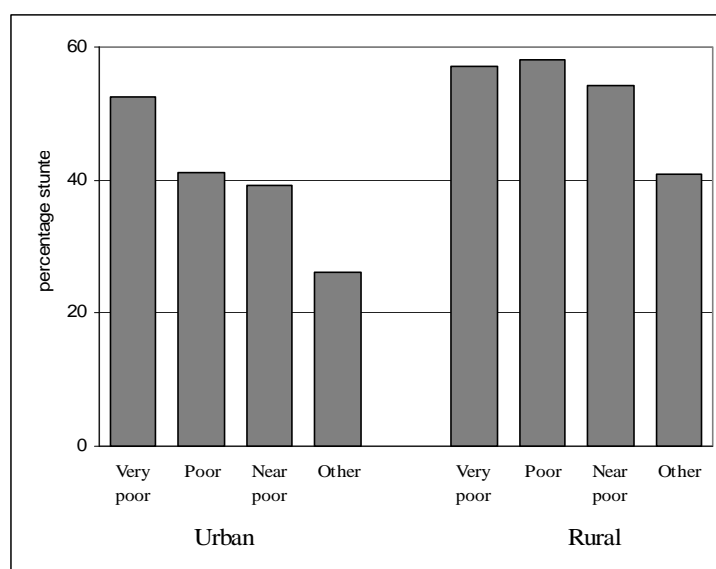
Figure 3. Attendance of a physician or trained nurse-midwife at delivery: urban and rural India (1998-2000)



Source: Author's calculations using Demographic and Health Surveys data.

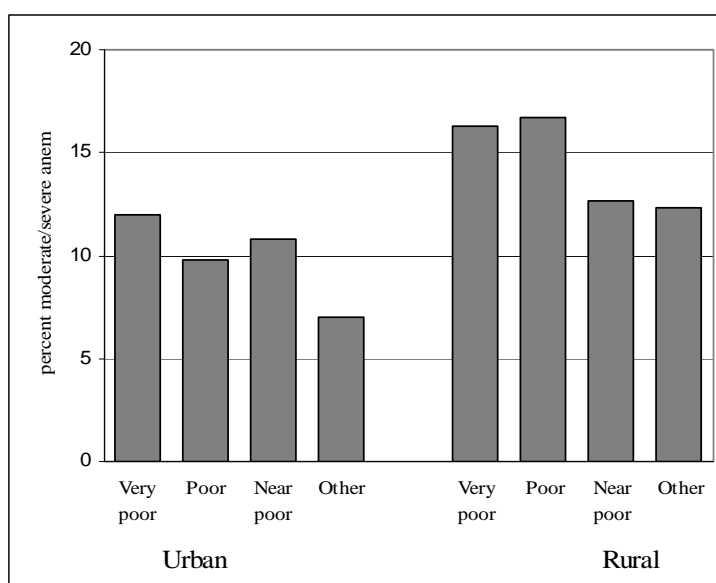
Large socioeconomic differences are also apparent among children, as can be seen in the percentages of Indian children who are stunted (figure 4) and in the child anaemia percentages for Egyptian children in the rural and urban areas of that country (figure 5). For both measures and countries, the storyline is much the same there is clear evidence of urban health advantage in general, but equally clear evidence that poor urban children suffer from much the same kinds of health disadvantages that afflict rural children.

Figure 4. Child malnutrition: stunting in urban and rural India (1998-2000)



Source: Author's calculations using Demographic and Health Surveys data.

Figure 5: Anaemia among children: urban and rural Egypt (2005)



Source: Author's calculations using Demographic and Health Surveys data.

It should not be surprising, on reflection, that the health situation of poor urban and rural residents are so similar. When poor city-dwellers live in close proximity to each other without the benefit of safe drinking water and adequate sanitation, they face elevated risks from water-, air-, and food-borne diseases. In its examination of DHSs data, the Panel on Urban Population Dynamics (2003) showed that the urban poor suffer disproportionately from a lack of access to piped drinking water and from inadequate sanitation. Table 2 presents selected findings from this study, comparing poor urban households with other urban and also rural households. As the table shows, the urban poor are markedly ill-served in comparison with other urban households. To be sure, rural households receive even less water and sanitation services than poor urban households although they benefit to an extent from lower population densities, which offer a form of natural protection against some communicable diseases.

TABLE 2. PERCENTAGES OF POOR URBAN HOUSEHOLDS WITH ACCESS TO SERVICES, COMPARED WITH RURAL HOUSEHOLDS AND THE URBAN NON-POOR.

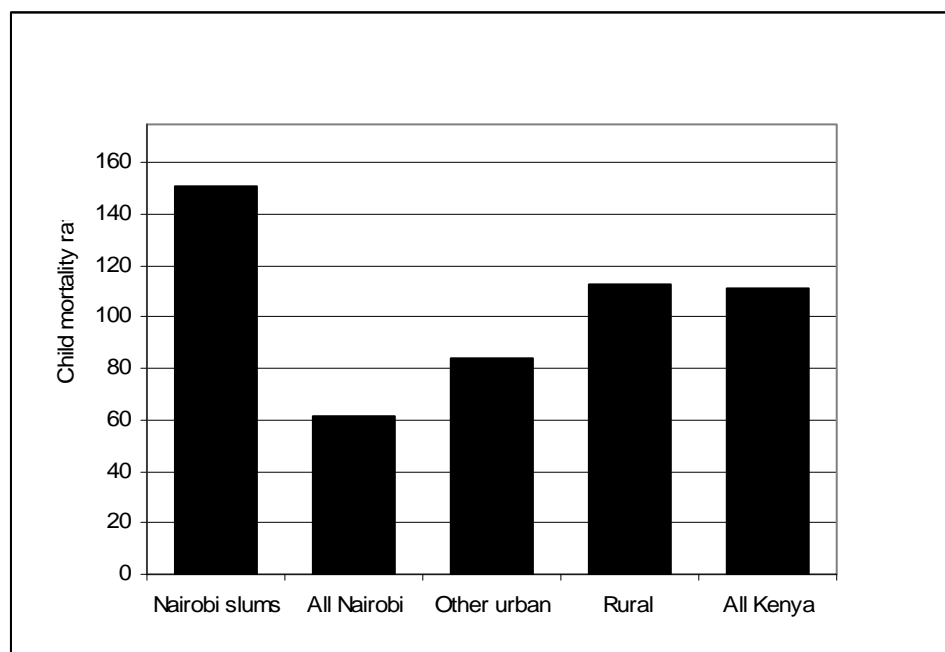
<i>DHS Countries in Region</i>		<i>Piped Water on Premises</i>	<i>Water in Neighbourhood</i>	<i>Flush Toilet</i>	<i>Pit Toilet</i>
North Africa	Rural	41.6	37.3	41.3	17.5
	Urban poor	67.3	27.8	83.7	8.5
	Urban non-poor	90.8	7.8	96.3	2.6
Sub-Saharan Africa	Rural	7.8	55.7	1.1	47.6
	Urban poor	26.9	61.6	13.0	65.9
	Urban non-poor	47.6	45.8	27.4	67.2
Southeast Asia	Rural	18.6	53.7	55.5	24.3
	Urban poor	34.0	53.7	61.8	22.9
	Urban non-poor	55.8	40.1	89.0	9.4
South, Central, West Asia	Rural	28.1	53.6	4.3	55.4
	Urban poor	58.0	36.3	39.8	34.1
	Urban non-poor	80.2	17.7	64.0	23.2
Latin America	Rural	31.4	36.4	12.6	44.0
	Urban poor	58.7	35.2	33.6	47.0
	Urban non-poor	72.7	24.9	63.7	31.6
TOTAL	Rural	18.5	50.7	7.5	46.6
	Urban poor	41.5	49.4	28.3	51.7
	Urban non-poor	61.5	34.0	48.4	46.5

Source: Panel on Urban Population Dynamics (2003).

1. The health of slum-dwellers

It is difficult to divide the overall risks facing slum-dwellers into the risks attributable to household poverty and the additional risks produced by the spatial concentration of poverty in slum neighbourhoods. Although not definitive on this score, figure 6 is at least suggestive of the impact of concentrated poverty on child mortality in Nairobi, Kenya. In the slums of Nairobi, child mortality rates at 150 per thousand births are substantially above the rates seen elsewhere in that city; slum mortality rates are high enough even to exceed rural Kenyan mortality. The addition to risk evident in the Nairobi slums may be due to multiple factors such as: the poor quality and quantity of water and sanitation in these communities; inadequate hygienic practices; poor ventilation and dependence on hazardous cooking fuels, the city's highly monetized health system, which for the poor, delays or prevents access to Nairobi's modern health services; and the transmission of disease among densely settled slum-dwellers.

Figure 6. Comparison of child mortality rates (sq_0) in the Nairobi slums sample with rates for Nairobi, other cities, rural areas and Kenya as a whole



Source: African Population and Health Research Center (2002).

There are additional factors of a social epidemiological character that are worth considering. Facing health threats from their unprotected physical environments—with the lack of services being a constant reminder of social exclusion—and lacking the incomes needed to counteract these daily threats, the urban poor may well feel unable to take effective action to safeguard their health. Poor individuals and families may thus lack the sense of self-efficacy needed to energize health-seeking behaviour in such difficult environments. Poor communities may be reminded by the absence of basic services that the community as a whole is socially excluded and lacks the political voice needed to bring attention to their plight. At the individual and family level, as we will discuss, social exclusion combined with the daily stresses of poverty, may bring on paralyzing fatigue, anxiety, low-level depression and other expressions of mental ill-health. At the community level, the symptoms may be expressed in the weaknesses and fragilities of local community organizations, that is, in the lack of what has been termed “bonding” social capital.

D. THE URBAN HEALTH SYSTEM

A distinguishing feature of urban health systems is the prominence of the private sector. Not surprisingly, given the higher average levels of income in urban populations and the income diversity that establishes market niches, private services tend to be much more developed in cities than in rural areas, especially in the larger cities (Dussault and Franceschini, 2006). Fee-for-service arrangements are generally characteristic of urban health care, whereas rural services are often ostensibly provided free of money cost (or made available for nominal fees) at public health-posts and clinics. In the more monetized urban economy, the urban poor without cash on hand can find themselves unable to gain entry to the modern system of hospitals, clinics, and well-trained providers.

As the Islam and others (2006) study has documented for Manila, Philippines and Indore, India, urban health providers are well aware of the effects of monetization on the health-seeking behaviour of the poor.

They see poor clients who, having endured their illnesses until care cannot be put off any longer; finally present themselves in a more debilitated condition than they would otherwise have been. Health providers realize that the poor are likely to abandon courses of prescribed medication to save on the costs of purchasing medicines, or may economize by buying less than what was prescribed. They are not really surprised when the poor fail to return as requested for follow-ups and assessments of progress.

On paper, at least, many countries offer subsidies allowing the poor to purchase certain medicines or types of care. But these subsidies often depend on an unsystematic set of arrangements, requiring poor patients and their families to spend time searching and negotiating with a bewildering variety of providers and suppliers. As they engage in this form of health-seeking behaviour, the poor can be discouraged by the difficulties of finding affordable transport, inconvenient hours of operation at clinics or health centres, the frequent absence of key staff, and long waits to receive care. A subsidy for the poor that exists in theory may prove to be no subsidy at all.

When the poor succeed in receiving formal health care, is that care likely to be of sufficient quality to make an effective difference to their health? A recent urban quality-of-care study in New Delhi raises serious doubts on this score (Das and Hammer, 2007a, b). The study was set in both slum and non-slum neighbourhoods, covering a range of household income levels. A full inventory was made of the health providers who serve these neighbourhoods; it revealed that a short walk would bring a typical neighbourhood resident within reach of 70 health providers of some sort. Even for the poor, access in the sense of geographic distance was not the problem in this case. The study assessed the quality of healthcare provision via a series of vignettes measuring provider knowledge of the steps to take in making a diagnosis and prescribing treatment or referral (rating the provider responses in relation to examination protocols), and by a follow-up in which many of the same providers were observed as they interacted with patients.

The study found that the quality of care available in the poor neighbourhoods was so low that the authors could fairly describe it as “money for nothing.” Both public-sector and private providers serve the poor neighbourhoods of Delhi, and both know less about appropriate care than the providers who practice in better-off neighbourhoods. Levels of provider knowledge were low across all study neighbourhoods, but were especially low in the poor neighbourhoods. Interestingly, in light of figure 2 on the quality of prenatal care in urban India, one vignette presented providers with a patient exhibiting the symptoms of pre-eclampsia, a life-threatening condition for pregnant women. The providers were not generally able to identify this threat. Evidently, the Indian public health sector does not see to it that its more competent providers are allocated to the poor neighbourhoods where they are needed most. It would seem that even strenuous health-seeking efforts on the part of the New Delhi poor would bring them no assurance of reasonable quality health care.

E. UNDER-APPRECIATED HEALTH RISKS

This section turns attention to specific urban risks and causes of mortality and morbidity. Several themes unite this material. First among them is the importance of disaggregation of urban health conditions and risk factors by poverty and place. A second and closely-related theme is that of urban social epidemiology, with emphasis on the concepts of individual and collective efficacy in health-seeking. The third theme in the discussion concerns health conditions or risks that are sometimes overlooked, or which are not as well-integrated as they might be in urban public health policies. Mental health is perhaps the leading example of such a condition. It is closely associated with poverty and with the health threats that arise from violence and alcohol abuse, which place disproportionate burdens on women. Other examples include the burdens of illness and death stemming from road traffic accidents and outdoor air pollution. In many countries, HIV/AIDS already occupies a prominent place on the urban

health agenda, whereas urban tuberculosis (and in some countries, malaria) receive less attention. In most developing countries, the threats that will arise from climate change are not yet prominent on the health agenda.

1. Mental health

Mental health made no appearance in the quantification of DALYs given in table 1, but it is arguably a central factor in the health of the urban poor, and one whose contribution to the urban burden of disease has been insufficiently appreciated. Over the past decade, the World Health Organization has issued a series of reports emphasizing the importance of mental health in developing as well as developed countries (World Health Organization, 1996, 2001, 2005b). Community-based studies of mental health in low- and middle-income countries suggest that 12 to 51 per cent of urban adults suffer from some form of depression (see 16 studies reviewed by Blue, 1999). Anxiety and depression are typically found to be more prevalent among urban women than men and are believed to be more prevalent in poor than in non-poor urban neighbourhoods (Almeida-Filho and others, 2004). In a study of Mumbai, Parkar and others (2003) give an evocative account of the stresses that affect men and women in a slum community just north of the city. Men in this community are deeply frustrated by the lack of work, and this is reflected in a high incidence of alcoholism and violence directed at their wives.

Although less is known about mental health among adolescents in low- and middle-income countries, recent studies indicate that this age group also warrants attention. Harpham and others (2004) made use of the World Health Organization's short-form, self-reporting questionnaire—a bank of 20 items designed to detect depression and anxiety—to study the mental health of adolescents in Cali, Colombia. Girls were found to be three times more likely than boys to exhibit signs of ill-health (as Prince and others, 2007 note, among adults the female–male ratio is typically 1.5–2.0) and further multivariate analysis showed that low levels of schooling, within-family violence, and perceptions that violence afflicts the community were all significantly associated with mental ill-health among adolescents.

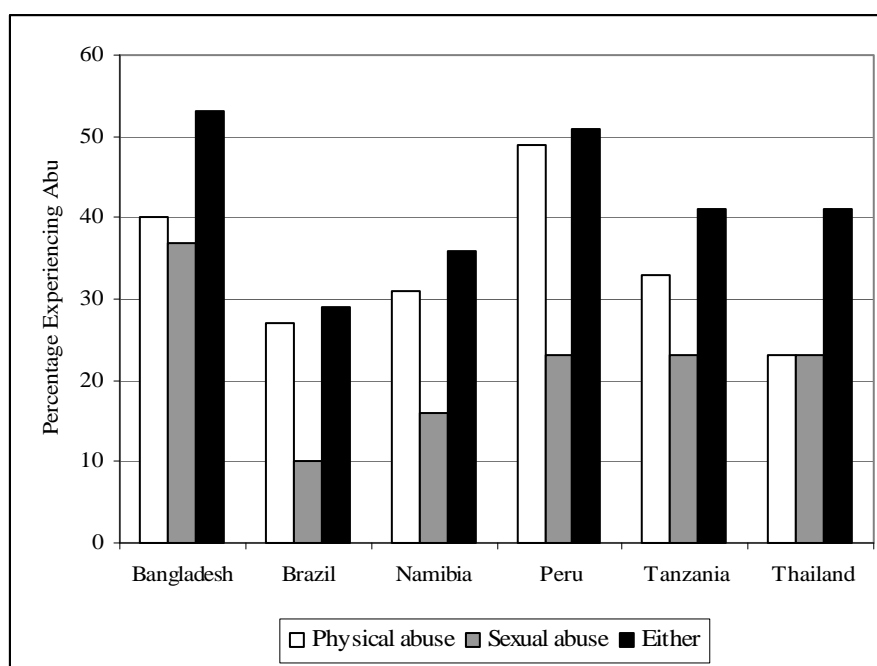
There are two avenues by which an individual's mental ill-health might affect other health dimensions. First, it has been hypothesized that socioeconomic stress undermines the physiological systems that sustain health (Prince and others, 2007; Boardman, 2004; McEwen, 1998; Steptoe and Marmot, 2002; Cohen and others, 2006; Hu and others, 2007). A second avenue needing exploration links women's mental health to the health-seeking energies they can deploy on behalf of their children and other family members. To judge from the review by Prince and others (2007), very little research has been conducted on how mental health affects women's health-seeking behaviour (Prince and others 2007, p. 867). Almost nothing seems to have been written on whether and how mental ill-health undermines the sense of self-efficacy that motivates a woman to seek healthcare for others in her family. This is a surprising gap in the literature, especially in view of the well-documented role that women play in protecting the health of their families and the equally common finding that mental ill-health is more common among women than men.

2. Intimate-partner violence and alcohol abuse

Violence in urban areas takes a variety of forms, ranging from political and extra-judicial violence to gang violence, local violent crime, and abuse taking place within the home. This discussion will be concerned mainly with intimate-partner violence and its links to alcohol abuse and women's mental health. Heise and others (1994), reviewed community-based data for eight urban areas from different regions of the developing world, and found that mental and physical abuse of women by their partners was common, with damaging consequences for women's physical and psychological well-being. Using data collected from a module included in several Demographic and Health Surveys, Kishor and

Johnson (2004) examined whether women had ever been beaten by a spouse or partner. In Cambodia, 18 per cent of women had been beaten and the percentages were also high in the other countries studied: Colombia (44 per cent), Dominican Republic (22 per cent), Egypt (34 per cent), Haiti (29 per cent), India (19 per cent), Nicaragua (30 per cent), Peru (42 per cent), and Zambia (48 per cent). In seeking to understand why women who were the victims of violence did not seek help from the authorities or others outside the home, this study found that embarrassment was a major reason given by women, as well as the belief that it would be futile to seek care or violence from a partner was simply to be endured, an inescapable part of life. In some countries (but not in all), poor women were more likely than other women to have experienced violence at the hands of their spouses or partners. Where the connection could be explored, strong links were also found between spousal alcohol abuse and violence.

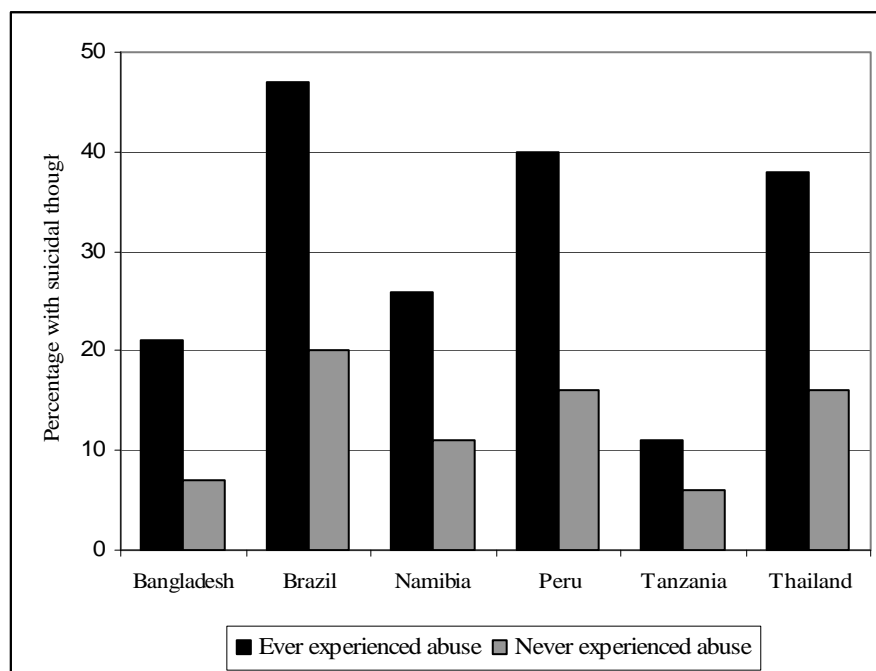
Figure 7. Experience of physical or sexual violence by an intimate partner since age 15, among ever-partnered urban women



Source: World Health Organization (2005a).

These findings were echoed in the World Health Organization (2005a) study summarized in figure 7, which covered both urban and rural study sites. The World Health Organization analysis also documented a close association between the experience of violence and women's mental health. As figure 8 shows, among the women in this Bangladeshi urban study site (left-most bars) who had been abused by their partner, 21 per cent had thoughts of suicide, as against 7 per cent who had not been abused. In all but one of the sites in the study, the difference in this measure of mental health was statistically significant, and as can be seen in the figure, the ratios are on the order of two to one or higher.

Figure 8. Percentage of ever-partnered urban women reporting suicidal thoughts, according to their experience of physical or sexual violence, or both, by an intimate partner



Source: World Health Organization (2005a).

3. Reproductive health

The Panel on Urban Population Dynamics (2003) provides a lengthy discussion of reproductive health among urban women. This section looks at a few points for emphasis. Among urban women, those who are poor are significantly less likely to use modern contraception to achieve control over their family-building (table 3). They are generally more likely to use contraception than rural women, but in some regions of the developing world there is little to separate the two groups. The unmet need for modern contraception—this is measured by the proportion of women in a reproductive union who say that they want to prevent or delay their next birth, believe themselves to be capable of conceiving, and yet do not make use of modern contraception to achieve their stated aims—is markedly higher among poor urban than other urban women.

As indicated in that study, it is not clear that even when they use modern contraception to prevent conception, urban women are able to do so in an effective manner. Although quantitative estimates are limited to selected case studies, unintended pregnancy and induced abortion are evidently not uncommon for urban women.³ To cite a few examples: women in three squatter settlements in Karachi, Pakistan were estimated to have a lifetime rate of 3.6 abortions per woman (Jamil and Fikree, 2002). Another study found abortion to be widespread in Abidjan, Côte d'Ivoire, where abortion is illegal, yet nearly one-third of the women surveyed who had ever been pregnant had had one (Desgrées du Loû and others, 2000). A recent study of Ouagadougou, Burkina Faso by Rossier (2007) estimated an annual abortion rate of 4 per cent among women aged 15–49 years, suggesting that over a reproductive lifetime, a woman would have 1.4 abortions on average. Calvés (2002) studied women in their twenties living in Yaoundé, Cameroon. Of these young women, 21 per cent reported having had an abortion and just over 8 per cent had had more than one. Once again, the fact that modern contraceptive services are available in urban areas does

not imply that women, especially poor women, have the knowledge and the social and economic wherewithal to make effective use of the methods.

TABLE 3. CONTRACEPTIVE USE FOR WOMEN AGED 25-29 BY RESIDENCE AND, FOR URBAN AREAS, POVERTY STATUS

<i>DHS Surveys By Region</i>	<i>All Rural</i>	<i>Urban Poor</i>	<i>Urban Non-poor</i>
North Africa	0.26	0.37	0.48
Sub-Saharan Africa	0.08	0.13	0.22
Southeast Asia	0.44	0.40	0.47
South, Central, West Asia	0.33	0.35	0.44
Latin America	0.32	0.37	0.47
Total	0.22	0.26	0.35

Source: Panel on Urban Population Dynamics (2003).

4. HIV/AIDS

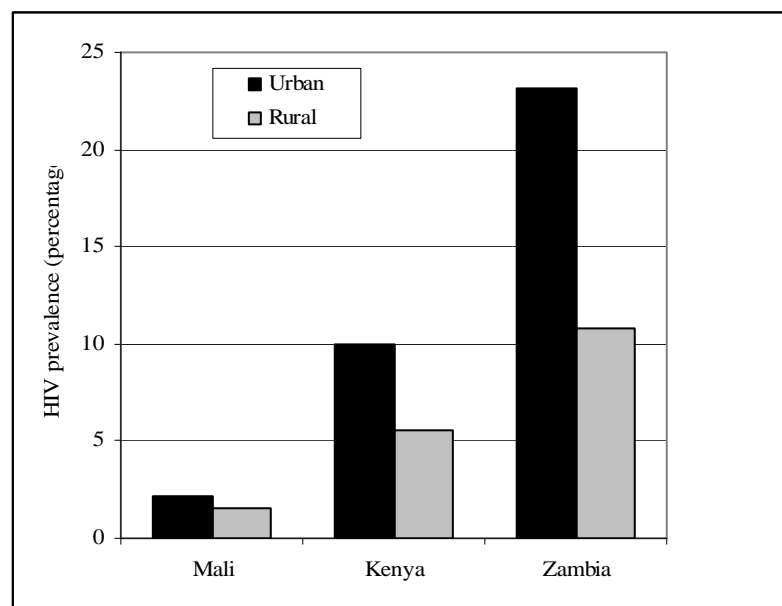
An enormous amount of literature is now available on the epidemiology of HIV/AIDS in both developing and developed countries. Despite the quantities of research underway on HIV/AIDS, much remains to be learned about its social components. Indeed, although HIV/AIDS is commonly thought to be more prevalent in urban than rural areas, until recently the scientific basis for this belief has been thin (UNAIDS, 2004, p. 31). In only a few developing countries are community-based studies of prevalence available to quantify the urban–rural differences.⁴ Figure 9 presents findings from several nationally representative community-based studies in which prevalence is estimated from blood samples taken in connection with a DHS survey. In these three cases: Mali, Kenya, and Zambia, urban prevalence rates were clearly much higher than rural rates. Where HIV/AIDS is concerned, there was little evidence of the “urban advantage” that is seen in other domains of health.

Because the community-based studies are relatively recent, the role played by urban poverty in the risks of HIV/AIDS in low- and middle-income countries is only beginning to be studied. Using the community surveys conducted under the DHS programme, Mishra and others (2007) found that contrary to expectation, HIV prevalence was higher among the better-off families. These families were more likely to live in urban areas, which accounts for a part of the association, and other risk factors (including sexual risk-taking, use of condoms, and male circumcision) tended to mask the association between living standards and prevalence. Even with statistical controls for such factors in place, a positive association between living standards and HIV prevalence persisted. In studies of urban adolescents and other selected socio-economic groups, however, poverty has been linked to higher HIV prevalence as well as to a number of contributing risk factors, including early sexual initiation and more reported forced or traded sex, which would seem to place poor women at higher risk of contracting the virus (Hallman, 2004). In short, the association of HIV/AIDS with living standards is still a matter of dispute.

5. Tuberculosis

Tuberculosis is among the leading causes of death for adults in low- and middle-income countries, killing an estimated 1.6 million people worldwide in 2005 (World Health Organization, 2007b). As in the nineteenth century, urban crowding increases the risk of contracting tuberculosis (van Rie and others, 1999), and high-density low-income urban communities may face elevated levels of risk. The interactions between HIV/AIDS and tuberculosis, and the spread of multi-drug-resistant strains of the disease, have generated fears of a global resurgence of tuberculosis.

Figure 9. Estimates of urban and rural prevalence of HIV from the Demographic and Health Surveys: Mali, 2001; Kenya, 2003; and Zambia, 2001-2002



Source: Mali Ministère de la Santé (2002), Kenya Central Bureau of Statistics (2003), Zambia Central Statistical Office (2003).

The concept of urban collective efficacy is directly relevant to the core of World Health Organization's treatment strategy, which is built upon the directly observed short course (DOTS) regimen. In a study of tuberculosis in urban Ethiopia, Sagbakken and others (2003) showed how the local social resources of urban communities (organized in "TB clubs") can be marshalled to reduce the stigma associated with the disease and encourage patients to adhere to the demands of the short-course regimen of treatment. Similar interventions have been fielded in urban India, as described by Barua and Singh (2003), using community health volunteers to identify local residents with symptoms of tuberculosis and refer them to hospitals for diagnosis; local health workers attached to the hospitals then provide follow-up care and lend support during treatment. As the country profiles presented in World Health Organization (2007b) make clear, a number of countries have yet to reach World Health Organization's treatment success rate target of 85 per cent of identified patients, and although data are scarce, it is very likely that detection rates of tuberculosis among the urban poor are well below rates for other urban residents.

6. Traffic-related injuries and deaths

The discussion will now turn to sectors that have not always been carefully integrated with urban public health programmes, yet which have significant implications for health. Injuries and deaths from traffic accidents are a case in point. Table 1 for Mexico showed just how important these are among all urban causes of death and disability, but the great range of factors involved—engineering concerns, urban planning, land-use policies, and individual behaviour—seem in many countries to have inhibited the public health sector from taking action. The scale of this public health problem is enormous—the World Health Organization (2004) estimated that road traffic injuries lead to 1.2 million deaths annually and an additional 20–50 million non-fatal injuries, the majority of which occur in low- and middle-income countries.

To elucidate the factors involved, Híjar and others (2003) conducted a detailed analysis of pedestrian injuries in Mexico City, where pedestrian death rates are estimated at three times those of Los Angeles. Using a mix of spatially-coded quantitative data and qualitative methods, these authors developed portraits of drivers and victims that underscore the importance of several mutually reinforcing risk factors: poverty, a lack of understanding of how drivers are apt to react to pedestrians, inattention by drivers and pedestrians alike to risky conditions, insufficient public investment in traffic lights and road lighting, and dangerous mixes of industrial, commercial, and private traffic. Bartlett (2002) draws on hospital and community-based studies to show how poverty and gender affect the risks, and how the time pressures on urban parents limit the effort they can devote to closely supervising their children.

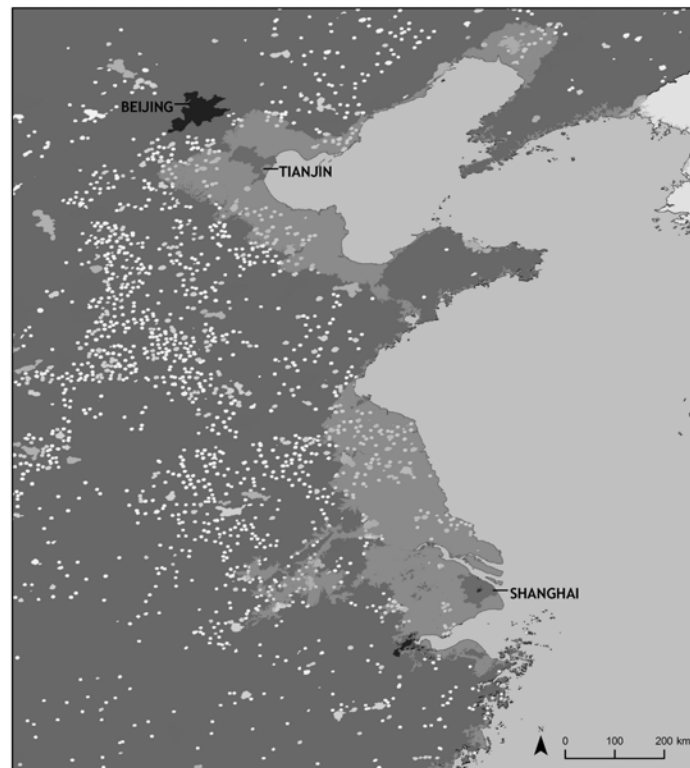
In seeking to raise the public-health profile of these important causes, the World Health Organization (2004, 2007a) has given particular emphasis to the risks that are faced by adolescents and young adults, among whom road traffic injuries rank (worldwide) in the top three causes of death in the ages of 5 to 25 years (World Health Organization, 2007a, p. 3). In World Health Organization's Africa region, it is pedestrians (especially children 5–9) who face the greatest risks, whereas in Southeast Asia, the deaths occur disproportionately to riders of bicycles and motorized two-wheelers, who are aged 15–24 years. In poor countries of Asia, it is the vulnerable road users—pedestrians, bicyclists and operators of motorized two-wheelers—who bear a greater share of the injury burden than the occupants of cars, vans and buses. For adolescents, young adults and children alike, males face greater risks than females.

The full range of interventions known to be effective in high-income countries has typically not been implemented in low-income countries. The interventions include behavioural interventions—the promotion through media campaigns and other public-health communication outlets of seatbelt use for adolescents and adults and appropriate restraints for infant and child passengers, and encouragement for bicycle and motorcycle riders to wear helmets—as well as traffic engineering concerns, such as the need to remove “unforgiving” roadside objects, properly maintain existing roads, and situate new ones so that high-speed traffic is not routed through densely-settled communities or placed near busy markets, schools and children's play spaces. In many low- and middle-income countries, meagre resources are allotted to traffic control and enforcement of speed and road safety laws. Public health planners will also need to assess the priority that has been given to emergency rescue services (which may involve connections between the health system and the police) and the availability of pre-hospital care and in-hospital trauma centres.

7. Future risks from climate change

Although much remains to be done to clarify the health implications of climate change, enough is already known to sketch the core elements of an urban adaptation strategy for low- and middle-income countries (Huq and others, 2007; McGranahan and others, 2007; Satterthwaite and others, 2007). According to current estimates, gradual increases in sea level are now all but inevitable over the coming decades, and this will place large coastal urban populations under threat. Alley and others (2007) forecast rises in sea level of between 0.2 and 0.6 metres by 2100, which will be accompanied by periods of exceptionally high precipitation, more intense typhoons and hurricanes, and episodes of severe thermal stress (The health effects of heat waves have not been much studied in the low- and middle-income countries, but the effects in Europe and the United States have been well-documented). In Asia, many of the region's largest cities are located in the flood-plains of major rivers (the Ganges–Brahmaputra, Mekong and Yangtze rivers) and in coastal areas that have long been cyclone-prone. Mumbai saw massive floods in 2005, as did Karachi in 2007. Flooding and storm surges also present a threat in coastal African cities (for example, Port Harcourt, Nigeria and Addis Ababa, Ethiopia) and in Latin America (for example, Caracas, Venezuela). Figure 10 depicts one of the major low-elevation coastal zones of China near Shanghai and Tianjin, two of the world's fastest developing economic regions, in which increasing numbers of urban dwellers will be placed at risk.

Figure 10. Yellow Sea region of China, areas within 10 metres of sea level



Source: McGranahan and others (2007).

Urban flooding risks in poor countries stem from a number of factors: the predominance of impermeable surfaces that cause water run-off; the general scarcity of parks and other green spaces to absorb these flows; rudimentary drainage systems that are often clogged by waste and which in any case are quickly overloaded with water; and the ill-advised development of marshlands and other natural buffers. When urban flooding takes place, faecal and other hazardous materials contaminate flood waters and spill into open wells, increasing the risks of water-borne disease. The urban poor are often more exposed than others to these environmental hazards, because the housing they can afford tends to be located in the riskier areas.

As Revi (2008) discussed in a detailed analysis of urban adaptation needs in India, governments from the local to national levels and their public health systems will need to anticipate increases in extreme-weather events. The Indian Ocean tsunami of 2005, heightened attention to coastal zone management in India and the region, but to judge from Revi's account, the responsibilities for urban adaptation and disaster management have been strewn across the bureaucratic landscape and are not yet organized in any coherent manner. Revi placed special emphasis on what is termed the "lifeline" infrastructure needed to cope with extreme events: the roads, bridges and other transport systems; water, sewer, and gas pipelines; infrastructure for coastal defences and drainage; the power and telecommunications infrastructure that are of vital importance during disasters; arrangements made with local non-governmental and relief agencies for alerting populations to imminent threats and responding to disaster; and the hospitals, fire and police stations, schools, military forces and other first-responders involved during the onset and aftermath of such disasters (Satterthwaite and others, 2007; McGranahan, 2007). To plan adequately for the upcoming era of climate change, the urban public health system must engage with partners across a broad range of

urban agencies. Many of the priority areas needing attention are already areas of concern on other counts—for instance, improvements in water and sanitation systems for the urban poor—but the prospects of climate change adds a new element of urgency to them.

F. CONCLUSIONS

The preceding sketch of urban health in developing countries is no substitute for the full treatment that the issues deserve, but it may at least suggest where further basic scientific and programme intervention research is most needed. Some of the key issues lie well within the scope of the public health sector. Among them is the quality of urban health care, which has received too little attention, and, given the monetization of the urban system, the performance of subsidy schemes meant to assist the poor, which also need careful examination.

A main theme in the preceding discussion is the need for the public health sector to work in tandem with other government agencies. Public health professionals cannot by themselves mandate the provision of safe water and adequate sanitation for the urban poor; nor can they, acting alone, reorganize traffic flows and pedestrian activities to reduce deaths and injuries, or prepare cities to adapt to upcoming threats from climate change. What is needed is what Harpham (2007) terms “joined-up government,” whereby public health agencies join with concerned actors in other sectors of municipal, regional, and national governments. Because the urban health system is dauntingly complex, with private for-profit and private nonprofit care being a significant presence in most cities, effective partnerships are also likely to require engagement with the private sector.

Public health officials have long known that a lack of access to drinking water and adequate sanitation afflicts poor urban-dwellers. But they have also known that investments in public health infrastructure require substantial financial sums, on a scale that dwarfs the typical public health budget. Although public health authorities can help publicize needs and exert pressure, the key decision-makers are generally located elsewhere in the political-bureaucratic system. Even these decision-makers may not be aware of the recent innovations in public-private packages of financing for improvements in urban water supply and sanitation, as well as housing, to which public health officials might direct attention (Evans, 2007).

With political and administrative decentralization now well underway in many developing countries, the arena in which creative partnerships are forged will increasingly be the local and municipal level. Much remains to be learned about how health expertise that is now situated in national ministries of health, and international funding and technical assistance that have been directed to national ministries, can be redeployed to meet the many health needs of cities and their neighbourhoods.

NOTES

¹ No quantitative account is now available of the percentage of the urban poor who live outside slums, but they are believed to be a sizeable group.

² The Dussault and Franceschini (2006) review emphasizes urban–rural imbalances in health personnel, but does not differentiate among types of urban areas.

³ AGI (1999) provide an excellent overview of induced abortion, a hidden and difficult-to-study area of health. See *International Family Planning Perspectives*, which is a good source of information on this topic; the publication archive is <http://www.guttmacher.org/pubs>. The journal *Studies in Family Planning* is another helpful source: <http://www.blackwell-synergy.com/loi/sifp>.

⁴ See Dyson (2003). Country profiles are available at <http://www.census.gov/ipc/www/hivaidn.html>, but these profiles are worked up from the reports of selected clinics and various sentinel sites, which do not necessarily yield statistically representative portraits for urban or rural populations.

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PROGRESS TOWARD THE CHILD MORTALITY MILLENNIUM GOAL IN URBAN SUB-SAHARAN AFRICA: THE DYNAMICS OF POPULATION GROWTH, IMMUNIZATION AND ACCESS TO CLEAN WATER

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A. ABSTRACT

Progress in child survival has been far slower than hoped for in sub-Saharan Africa. Since the 1990s, declines in child mortality have reversed in many countries in the region, while in others, they have either slowed or stalled, making it improbable that the target of reducing child mortality by two thirds by 2015 will be reached. This paper highlights the implications of urban population growth and access to health and social services in achieving Millennium Development Goal (MDG) 4: Reduce Child Mortality. Specifically, it examines trends in childhood mortality in sub-Saharan Africa in relation to urban population growth, vaccination coverage and access to safe drinking water.

Correlation methods are used to analyze national-level data from Demographic and Health Surveys and from the United Nations. The analysis is complemented by case studies on intra-urban health differences in Kenya and Zambia.

Of the 22 countries included in this study, only 5 have recorded declines in urban child mortality that are in line with the MDG target of about four per cent per year; 5 others have recorded an increase; and the remaining 12 countries witnessed only minimal decline. Rapid growth of urban population is associated with negative trend in access to safe drinking water, vaccination coverage and ultimately to increasing or timid declines in child mortality. There is evidence of intra-urban disparities in child health in some countries like Kenya and Zambia.

Failing to appropriately target the growing sub-group of the urban poor and improve their living conditions and health status—which is an MDG target itself—way result in lack of improvement on national indicators of health. Sustained expansion of potable water supplies and vaccination coverage among disadvantaged urban dwellers should be given priority in the efforts to achieve the child mortality MDG in sub-Saharan Africa.

B. BACKGROUND

Improvements in child survival have been very poor in sub-Saharan Africa. Since the 1990s, declines in child mortality have reversed in many countries in the region, while in others they have either slowed or stalled, making it improbable that the target of reducing child mortality by two thirds by 2015 will be reached by the majority of the countries in the region. Under-five mortality rate (U5MR) in sub-Saharan Africa varied from 185 (per 1,000 live births) in 1990 to 172 in 2003 (United Nations Development Programme (UNDP), 2003; United Nations, 2005). This corresponds to an overall decline of about 7 per cent, or nearly 0.5 per cent on an annual basis, while the MDG targets an average reduction of 4.3 per cent per year. If the region had been on track to meeting the MDG on child mortality, U5MR would be around 105 in 2003. At current trends, mortality rate in children younger than five years will decline by less than 15 per cent by 2015 from the 1990 base year, compared to the expected goal of 66.7 per cent.

It is estimated that more than 10 million children under the age of five years die each year, with about 90 per cent of these deaths occurring in just 42 countries, 36 of which are in sub-Saharan Africa (Black and others, 2003). Numerous studies on infant and under-five mortality in developing countries indicate that most of these deaths are from preventable causes—diarrhoea, pneumonia, measles, malaria, HIV and AIDS and the underlying malnutrition—and suggest that the goal of reducing childhood mortality by two-thirds by 2015 could be achieved if few known and effective child survival interventions could reach population groups that need them most (Black and others, 2003; Jones and others, 2003; Bryce and others, 2005). These include immunization, safe water and sanitation, micronutrient supplementation, nutrition counselling, and, in malaria-prone areas, insecticide-treated bed nets (Mohan, 2005). The task of scaling up child-health interventions to full coverage in countries with the highest mortality is within reach, and resources should be mobilized to match governments' and development partners' commitments with action (Mason, 2005).

1. Why focus on urban sub-Saharan Africa?

In sub-Saharan Africa, the 1980s was largely dominated by the protracted economic recession that affected most developing countries, with negative impact on food security and various aspects of human development (Food and Agricultural Organization (FAO), 2000). Countries were required by international lending institutions to implement structural adjustment programs meant to stabilize their economies. Real wages were reduced together with the provision of public social services; unemployment increased; and public support schemes in favour of agriculture and rural development was downscaled or abandoned (FAO, 2000; Cornia and others, 1987). This process resulted in increased migration flows, generally composed of disadvantaged families, from rural to urban areas, who were likely to have a harder time coping in urban areas than in rural areas (Sastry, 2004). These trends were more pronounced in sub-Saharan Africa than in other parts of the developing world. Between 1980 and 2000, the region's urban population grew by about 4.7 per cent per year, compared to 3.5 per cent for the developing countries as a whole (United Nations, 2004), while at the same time, per capita gross domestic product (GDP) dropped by 0.8 per cent per annum (World Bank, 2003), and food production index per capita increased by only 0.2 per cent per year (FAOSTAT).

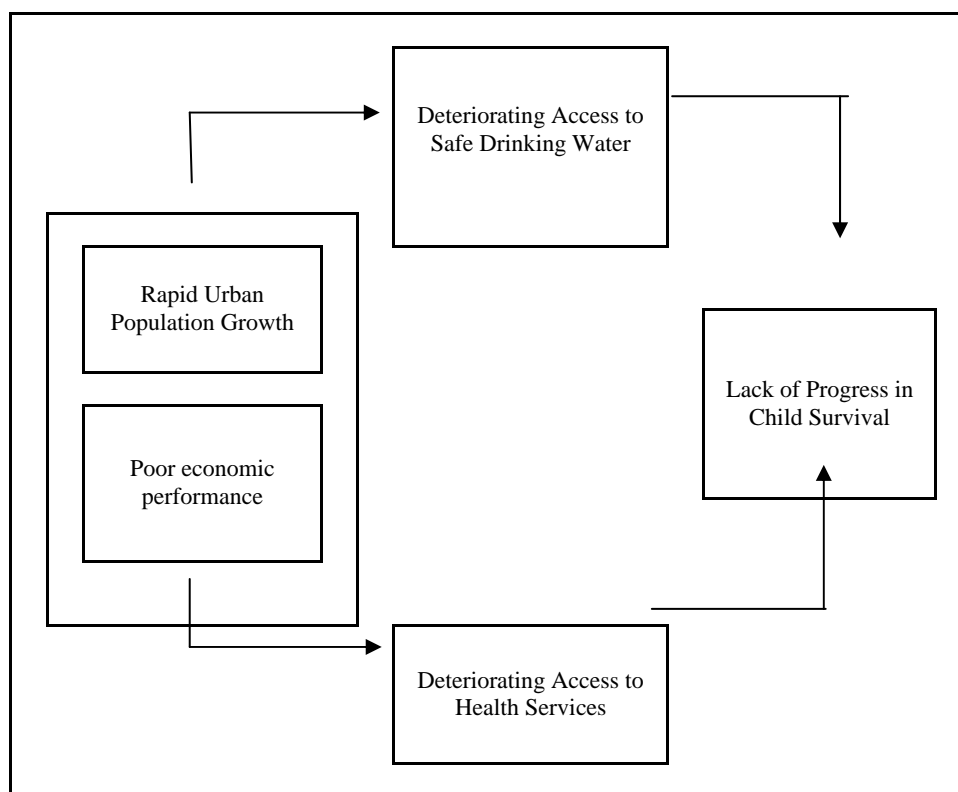
As a result of this rapid urbanization in the context of poor economic performance and poor governance, a rapidly increasing proportion of urban dwellers are living below the poverty line in overcrowded slums and shantytowns. These slums generally characterized poor environmental and sanitation conditions, poor access to basic amenities and social and health services, and poor livelihood opportunities, which in turn worsen the residents' susceptibility to various health problems (Zulu and others, 2002; African Population and Health Research Center (APHRC), 2002).

While national trends in child mortality are generally worrying, more worrying is the emerging body of knowledge suggesting that the worsening child health outcomes in sub-Saharan Africa may be accentuated among the urban poor (Tim and Lush, 1995; Brockerhoff and Brennan, 1998; Meno and others, 2000; Victora and others, 2003). Not only are disparities widening between the poor and non-poor in urban areas, in some countries current levels of child indicators among the poor in urban areas exceed the levels for all other sub-groups including rural residents (APHRC, 2002). A number of studies have also suggested that the rural/urban ill-health and mortality gaps in sub-Saharan Africa have narrowed in recent years, mainly as a result of stalling and even upturn in urban trends, as urban economic and environmental conditions have sharply deteriorated in rapidly growing cities (Fotso, 2007; Gould, 1998).

This study seeks to contribute to the growing evidence base on how far developing countries in general, and sub-Saharan African countries in particular, are progressing in reducing the persistent high child mortality rates. Though the MDGs have been set and are typically assessed at the national level, we argue that focus on urban areas of sub-Saharan Africa provides a useful starting point for stocktaking of factors likely to get the region on track for meeting the child mortality target. More specifically, the goal

of this paper is to assess the inter-relationships between urban population growth, trends in access to safe drinking water and vaccination coverage, and child mortality in urban areas of sub-Saharan Africa. Despite the amount of work on child morbidity and mortality in developing countries (Amouzou and Hill, 2004; Madise and others, 2003; Hobcraft and others, 1984), very few have focused on urban areas within a cross-country perspective. The paper is premised on a conceptual hypothesis which suggests that rapid urbanization amidst declining or stagnating economies is associated with poor access to safe drinking water and low health utilization, which in turn, lead to poorer or lack of progress in child survival in urban areas. This hypothesis is illustrated in figure 1.

Figure 1. Conceptual hypothesis on the linkages between urban population growth, access to water and health services, and trends in child mortality



The importance of access to safe drinking water for child health, especially in urban areas, has been well documented as diarrhoea remains the major cause of deaths among children under five (Black and others, 2003; Bryce and others, 2005; Woldemichael, 2000). In developing countries, rural-urban migration that has been the main fuelling factor of population growth in cities, strain existing water infrastructure. In this context, underprivileged urban populations often pay exorbitant prices for clean—and sometimes unclean - water, while services to wealthier groups are heavily subsidized (Mintz and others, 2001). Child immunization is another key factor influencing child survival in developing countries and has been considered the most cost-effective health intervention (Mavimbe and others, 2005). Vaccine-preventable diseases remain major causes of morbidity and mortality in Africa. Reductions in vaccine-preventable diseases have been recorded following the introduction of appropriate vaccines for routine use in infants (Black, Morris and Bryce, 2003; World Health Organization (WHO)/United Nations Children's Fund (UNICEF)). Child survival is also influenced by the HIV epidemic through several mechanisms including mother-to-child transmission and breastfeeding (Newell and others, 2004), and evidence from various African countries suggests that paediatric AIDS has become one of the leading factors of mortality (Garenne and Gakusi, 2006). However, the fact that child mortality declined steadily in some of the

countries heavily hit by HIV/AIDS such as Malawi, and went down only minimally in some of the countries with low HIV prevalence like Senegal, suggests that AIDS may not be the only problem.

This study shows that rapid rates of urban population growth are associated with negative trends in access to safe drinking water and in vaccination coverage, and ultimately to increasing or timid declines in child mortality. There is evidence of intra-urban disparities in child health in countries like Kenya and Zambia.

C. METHODS

This study uses data from the Demographic and Health Surveys (DHS) of 22 sub-Saharan African countries with two or more surveys carried out between the 1990s and the 2000s. DHS surveys provide detailed health information on women aged 15 to 49 years, on children born in the three or five years preceding the survey date, and on relevant household characteristics including the type of drinking water source. Data on population growth are from the Population Division of the United Nations. Univariate and correlation analysis are carried out on the following variables:

1. Annual urban population growth between 1980 and 2000.
2. Annual percentage change over time in urban under-five mortality rate. Rates for the ten-year period preceding the survey are used for the computation.
3. Annual percentage change over time in the proportion of urban households with access to clean water.
4. Annual percentage change over time in the proportion of children 12-23 months who are fully vaccinated. A child is fully vaccinated if he/she has received bacilli Calmette-Guerin (BCG), measles, three doses of diphtheria, pertussis and tetanus (DPT) and polio vaccinations (excluding polio 0).

Table 1 shows the qualifying countries, the survey periods, and the variables presented above. The results of the macro-level correlation analysis are complemented by case studies using data from Kenya and Zambia. For Kenya, supplementary data are used from the Nairobi Cross-sectional Slum Survey (NCSS) carried out by the APHRC in 2000. The survey covered a representative sample of all slum settlements in Nairobi city. The study was designed to provide comparable data to the 1998 and 2003 Kenya Demographic and Health Surveys, with the aim of determining the magnitude of intra-urban health inequalities in Kenya. Based on census enumeration areas used in the 1999 Kenya National Census, a representative cross-sectional sample of households in all slum clusters of Nairobi was designed. Like in the DHS, enumeration areas (EAs) were selected at the first stage of sampling, while households were selected from sampled EAs at the second stage. In total, the NCSS administered interviews to 4,564 households and 3,256 women of reproductive age (15-49) (APHRC, 2002). The data, in conjunction with the Kenya DHSs, allow for comparative analyses of social, health and reproductive health indicators between respondents residing in the slums of Nairobi, and residents in other urban areas and rural Kenya.

Data was use from the NCSS to identify households that were probably located in slum areas in the Kenyan and Zambian DHSs. From the NCSS, only seven percent of households in slums had own flush toilets. Using the absence of own flush toilet as an indicator of slums in both Kenya and Zambia, we were able to obtain intra-urban differences. The case studies contrast infant mortality rates for the five-year period preceding the survey between slum and non-slum sub-groups. There were problems with computing U5MR for some years because of small numbers of observations in some sub-groups. We also

examine access to piped water and child immunization over time among slum and non-slum children in Kenya and Zambia.

The study reported in the paper did not require any ethical approval, as it mainly used secondary analysis of publicly available data from the well-known DHSs conducted in most developing countries since the mid-1980s.

TABLE 1 – TRENDS IN UNDER-FIVE MORTALITY, POPULATION GROWTH, ACCESS TO CLEAN WATER, AND CHILD VACCINATION IN URBAN SUB-SAHARAN AFRICA

	First Survey Year ^a	Last Survey Year ^a	Under-five mortality rate ^c	Urban population growth ^b	Access to safe drinking water ^c	Full vaccination ^d
Benin	1996	2001	-2.3	5.6	2.8	2.2
Burkina Faso	1992/93	2003	-0.8	6.3	2.8	-0.5
Cameroon	1991	2004	-0.1	5.0	0.1	0.6
Chad	1996/97	2004	-0.8	4.1	8.1	0.3
Côte d'Ivoire	1994	1998/99	0.9	4.7	0.3	5.7
Eritrea	1995	2002	-5.6	3.6	1.7	1.6
Ghana	1993	2003	0.3	4.6	-0.5	0.6
Kenya	1993	2003	2.2	7.4	-2.0	-4.1
Madagascar	1992	2003/04	-5.6	4.7	-1.5	1.6
Malawi	1992	2004	-4.6	5.8	-0.8	-1.7
Mali	1995/96	2001	-0.6	5.2	3.3	-0.6
Mozambique	1997	2003	-0.8	6.7	-2.7	-0.8
Namibia	1992	2000	-6.7	4.9	0.2	1.9
Niger	1992	1998	-2.7	5.8	0.7	0.2
Nigeria	1990	2003	1.2	5.3	-4.9	-5.4
Rwanda	1992	2000	-1.2	7.8	1.1	-2.3
Senegal	1992/93	1997	-2.9	4.3	0.1	3.3
Tanzania	1992	2004	-3.2	7.2	-1.2	-0.2
Togo	1988	1998	-2.6	5.3	0.8	1.5
Uganda	1995	2000/01	-5.0	5.0	6.6	-5.1
Zambia	1992	2001/02	-0.8	2.2	-0.9	0.3
Zimbabwe	1994	1999	1.8	4.9	0.2	-5.0

Source: Demographic and Health Surveys database. Available from <http://www.measuredhs.com/What-We-Do/Survey-Types/DHS.cfm>. Accessed 5 January 2008.

1) First and last demographic and health surveys (DHS) carried out between the 1990s and the 2000s.

2) Annual growth of urban population (1980-2000). Source: Population Division, United Nations

3) Annual variation of the percentage of urban households with access to safe drinking water.

4) Annual variation of the percentage of urban children aged 12-23 months who are fully immunized.

5) Annual variation of urban under-five mortality rate.

D. RESULTS

1. Univariate results

As can be seen in table 1, five of the 22 countries (Namibia, Eritrea, Madagascar, Uganda and Malawi) recorded declines in urban child mortality in line with the MDG 4 target of about 4 per cent per annum, while Kenya, Zimbabwe and Nigeria witnessed a sharp increase. Between these two end of the scale, six countries (Tanzania, Senegal, Niger, Togo, Benin and Rwanda) had a slow decline in child mortality ranging from 1 per cent to 3.2 per cent per annum; and eight others (Zambia, Burkina Faso, Chad, Mozambique, Mali, Cameroon, Ghana and Côte d'Ivoire), almost remained unchanged, with annual change ranging from -0.9 per cent to +0.9 per cent per year.

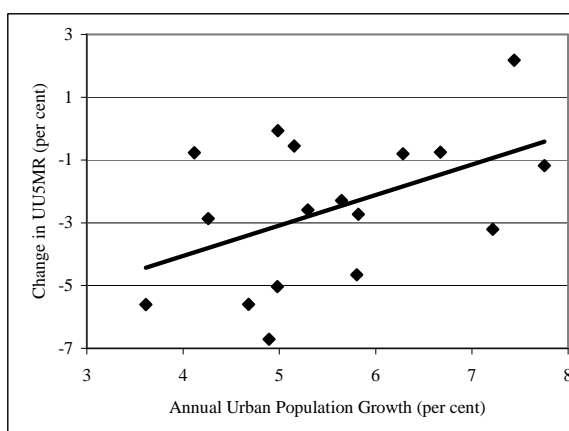
Between 1980 and 2000, the lowest urban population growth was noted in Zambia (2.2 per cent per year), Eritrea, Chad and Senegal (between 3.6 per cent and 4.5 per cent), whilst five countries (Burkina Faso, Mozambique, Tanzania, Kenya and Rwanda) had annual urban population growth ranging from 6.3 per cent and 7.8 per cent. With regard to access to safe drinking water, nine countries achieved improvement in access to clean water of between 0.7 per cent (Niger) and 8.1 per cent (Chad); seven others recorded a decline ranging from 4.9 per cent (Nigeria) to 0.8 per cent (Malawi); while the six remaining countries witnessed almost no change. Six countries witnessed a decline in the coverage of full vaccination ranging from 5.4 per cent (Nigeria) to 1.7 per cent (Malawi). At the other end of the scale, six others recorded an increase of between 1.6 per cent (Madagascar) and 5.7 per cent (Côte d'Ivoire).

2. Correlation analysis

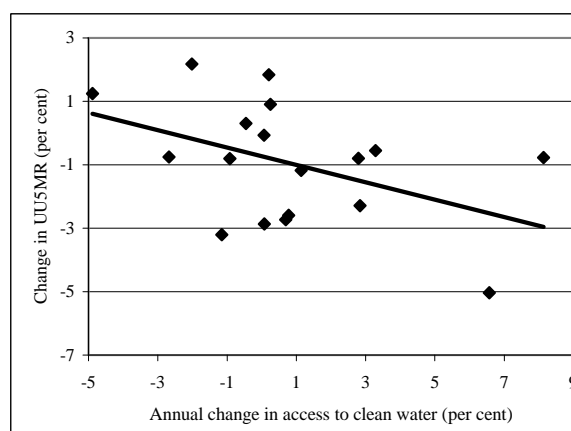
Figure 2 displays the inter-relationships between trends in urban under-five mortality, urban population growth, and trends in access to safe drinking water and vaccination coverage. The upper left graph shows the association between urban population growth and change over time in urban under-five mortality. As expected, it indicates that countries with rapid rates of urban population growth tended to experience worsening trends or timid declines in urban child mortality. The correlation coefficient (+0.41) is statistically significant at the level of 0.10. Next, we investigate the extent to which access to clean water plays a role in the above association. As can be seen from the upper right graph of figure 2, change over time in access to water is associated with trends in child mortality (correlation of -0.45; p value of 0.06). Countries with greater improvement in access to safe drinking water among the urban dwellers were likely to witness higher declines in under-five mortality. Moreover, the middle left graph indicates that higher rate of urban population growth is associated with deteriorating access to safe drinking water over time (correlation of -0.42; p value of 0.07).

Finally, the role of access to health services—proxied by child full vaccination— in the association between urban population growth and trend in child mortality is examined. The middle right graph of figure 2 shows a very strong negative association between trends in child vaccination and change in under-five mortality (correlation of -0.73, p value of 0.00). It indicates that countries with greater improvement in child vaccination coverage consistently displayed more rapid declines in urban child mortality. Further, the bottom left graph indicates that higher rate of urban population growth is associated with decline or minimal increase in urban child vaccination coverage (correlation of -0.57, p value of 0.01). Overall, the inter-relationships between urban population growth, trend in access to clean water and health services, and change in under-five mortality appear to be consistent with our conceptual framework.

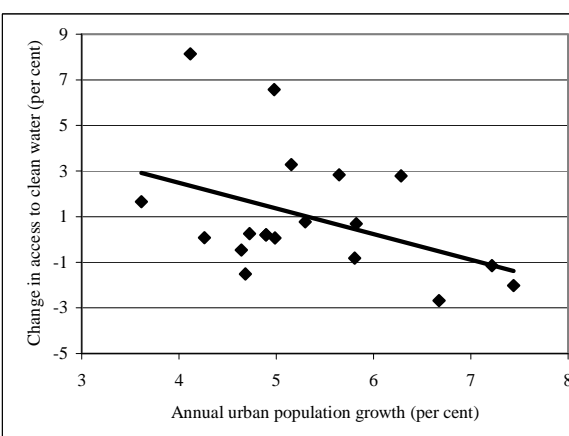
Figure 2. Inter-linkages between trends in urban population growth, access to safe drinking water, vaccination coverage, and under-five mortality in sub-Saharan Africa



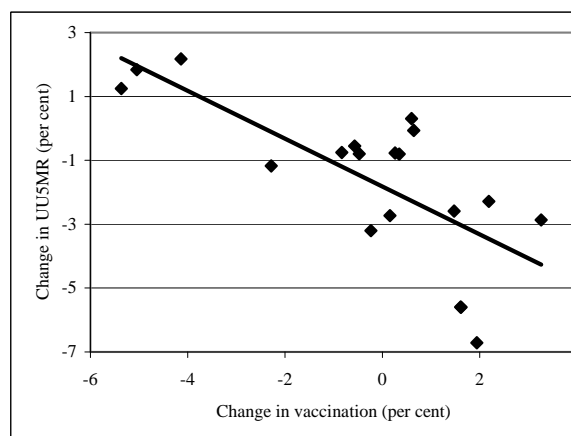
Population growth and under-five mortality in urban areas of SSA (4 outliers excluded). $r = +0.41(0.09)$



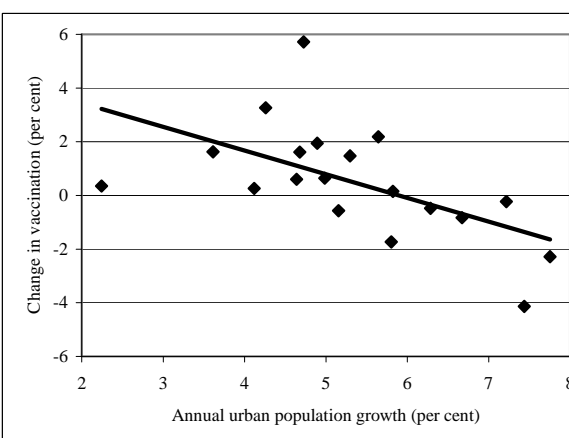
Access to safe water and under-five mortality in urban areas of SSA (4 outliers excluded). $r = -0.45(0.06)$



Population growth and access to safe water in urban areas of SSA (3 outliers excluded). $r = -0.42(0.07)$



Child vaccination and under-five mortality in urban areas of SSA (3 outliers excluded). $r = -0.73(0.00)$



Population growth and child vaccination in urban areas of SSA (3 outliers excluded). $r = -0.57(0.01)$

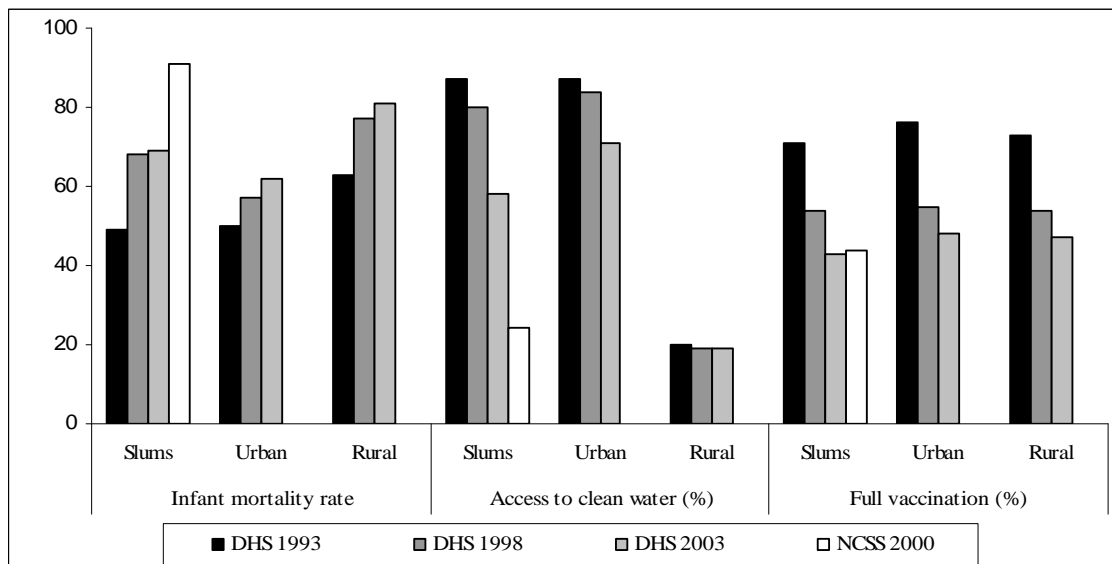
3. Case studies of Kenya and Zambia

a Kenya

Kenya typifies the current urban population boom and associated urban health and poverty problems. Between 1980 and 2000, its urban population increased at an annual rate of 7.2 per cent, whilst per capita GDP dropped annually by about 0.1 per cent. According to the 2003 DHS, about one quarter of Kenyans were living in urban areas. The Welfare Monitoring Survey shows that while absolute poverty increased from 48 to 53 per cent in rural areas of Kenya between 1992 and 1997, it almost doubled from 27 to 50 per cent over the same period in Nairobi City (Central Bureau of Statistics, 2000). Nairobi has indeed grown into a poverty hub with more than half of its population estimated to be residing in slum settlements (Matrix Development Consultants, 1993).

As can be seen in figure 3, infant mortality in Kenya has been increasing since the early 1990s. This increase in childhood mortality was observed in both rural and urban areas but was generally faster in slums than in rural areas. Between 1993 and 1998, the increase in infant mortality was about 39 per cent in slums, compared with 14 per cent and 22 per cent in urban Kenya and rural areas, respectively. Using year 2000 NCSS data, which was representative of slums in Nairobi, we see that a much higher mortality rate exists among slum children (91) than those living in mainstream urban areas or more importantly, than those in rural areas of Kenya (81). Figure 3 also shows that access to clean water has been deteriorating in urban slums between 1993 and 2003. Slightly over half of households in slums had access to piped water in the 2003 DHS compared with 87 per cent in the early 1990s. This represents a drop of about 33 per cent, compared with 18 per cent in urban Kenya and 5 percent in rural areas. The much lower figure reported from the NCSS data (24 per cent) is due to the fact that water bought from street vendors were not classified as safe. Similarly, the proportion of urban children who were fully immunized dropped markedly from 76 percent in 1993 to 48 per cent ten years later. Within slums, immunization rates were lower and dropped from 71 to 43 per cent.

Figure 3. Infant mortality, access to safe water and full vaccination in Kenya



The disadvantage of the poor is not limited to child health. Detailed analysis of DHS data (results not shown) further indicate that in some countries like Kenya, while the fertility of the richest 20 per cent has declined by more than 1.5 children in the last decade, the poorest 20 per cent has either remained unchanged or has increased by more than one child in some countries. The poor have almost

three times more children than the rich, they are also three times less likely to use contraceptives and three times more likely to have unmet need for family planning. These results suggest that the high fertility of the poor may be largely unplanned or unwanted. With growing poverty and the growing poor-rich fertility gap, increasingly, more children are born to poorer families (Brockhoff and Brennan, 1998). This has implications for future population growth and the attainment of the health MDGs.

b. Zambia

Zambia is another interesting case study, exhibiting higher infant mortality than Kenya overall, but showing a mix of increasing and declining trends in the last few decades. Of particular focus to this paper are the intra-urban mortality differentials in childhood mortality and access to services and healthcare. The growth of urban centres in Zambia can be traced to the late 1950s, where urban growth rates of more than 8 per cent were recorded when copper mining was at its peak. Much of this growth was rural-urban migration as well as international migration. From the mid-1970s, copper prices started to fall, thus affecting the economy and the provision of essential services. According to the United Nations Population Division indicators, the urban population growth rate was less than 3 per cent between the early 1990s and mid 2000s. Despite the slow down in urban growth rate, about 40 per cent of the Zambians reside in urban areas, which is high for the region. Between the 1960s and 1970s, infant mortality in Zambia declined from about 141 to 90 deaths per 1000 live births, but a reversal of this trend was noticed in the mid-1990s, with infant mortality rising to about 100 deaths per 1000 live births. Evidence of worsening child health among the urban poor was reported by Madise and others, who analyzed the 1992 and 1996 Zambian DHS data to identify changes in socioeconomic and demographic determinants of infant mortality (Madise and others, 2003). They found that in the mid-1990s, children of the urban poor had a 46 per cent higher probability of dying in infancy than the poorest rural children. They also reported reversal in household socioeconomic status between the two surveys and lower utilization of health care.

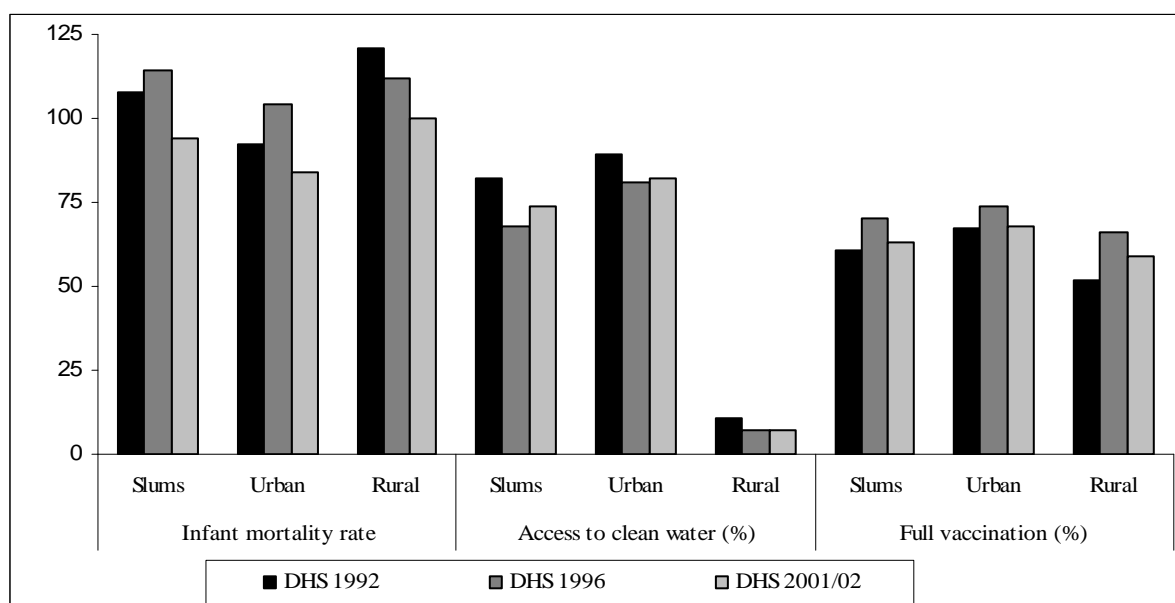
Figure 4 lends further evidence of deteriorating child health among urban inhabitants between the early and mid-1990s. The pattern shows an increase in infant mortality in slums of about 7 per cent compared with a reduction of 3 per cent in rural areas between the 1992 and 1996 DHS surveys. While mortality in urban areas increased in the 1990s, the rural areas experienced sustained decline between the early 1990s and early 2000s. Access to piped water in slum areas declined between the early and mid-1990s, lending support to the poor provision of social services during the economic slump of the country. In 1992, 82 per cent of households in the slums of Zambia had access to piped water, but this percentage dropped to 68 in the 1996 survey. The general decline in vaccination coverage between 1992 and 2001 was more pronounced in the slums (-13 per cent) than in urban Zambia as a whole (-9 per cent).

E. DISCUSSION

Declines in child mortality have been very poor in sub-Saharan Africa since the early 1990s, making it difficult for the region to meet—or at least get closer to—the MDG on child mortality. This paper has provided some degree of evidence on the linkages between urban population growth, change over time in access to safe drinking water and health services, and trends in child mortality. It has focused on urban areas of sub-Saharan Africa—where health outcomes are generally perceived to be better and services more accessible—to highlight an issue that seems to be neglected: high rates of urban population growth will greatly undermine efforts to improve the wellbeing and reduce poverty, which is the underlying goal of the MDGs.

Our results show that only 5 of the 22 countries included in the study have recorded declines in urban child mortality that are in line with the MDG 4 target of about 4 per cent per year; 5 others have recorded an increase; and the remaining 12 countries have witnessed only minimal decline. The study has

Figure 4. Infant mortality, access to safe water and full vaccination in Zambia



shown that rapid rate of urban population growth is associated with increasing or timid declines in urban child mortality. Consistent with our initial hypothesis, poor access to safe drinking water and to health services are associated with periods of deteriorating child health. Higher urban population growth is associated with negative trends in access to safe drinking water, while at the same time, countries with greater improvement in access to safe drinking water among urban dwellers tended to experience higher declines in urban childhood mortality. Similarly, higher rate of urban population growth is associated with decline or minimal increase in child vaccination coverage, and countries with greater improvement in child vaccination coverage consistently displayed more rapid declines in urban child mortality.

Our findings concur with those of other studies that have shown the health effects of inadequate water supply and poor sanitation. It is estimated that almost half the people in the developing world have one of the main diseases related to inadequate water supply and sanitation, and that about 90 per cent of diarrhoeal disease—the second leading cause of death among children under five years of age—is attributed to unsafe drinking water, inadequate sanitation and poor hygiene (Mohan, 2005; Wagstaff and Bustreo, 2004). Other research at the micro level has shown that improved availability and use of piped water would have substantial effects on reducing urban mortality, especially during the post-neonatal and childhood periods (Woldemicael, 2000). Immunization, on the other hand, remains one of the most cost-effective health interventions likely to help achieve the MDG on reducing child mortality (Bryce and others, 2005). WHO/UNICEF global immunization strategy for the years 2006-2015 noted regrettably that immunization coverage has increased only marginally in some regions of the world since the early 1990s, and emphasizes the need to improve existing levels of vaccine coverage, particularly by accessing hard-to-reach populations on a regular basis.

Results from the Kenya case study indicate that urban under-five mortality has increased over time, and importantly, that urban poor children have higher mortality than even their rural counterparts. They also indicate that Kenyan poor women have almost three times more children than the rich, are three times less likely to use contraceptives and are three times more likely to have unmet need for family planning. Such poor reproductive health outcomes could further worsen child health outcomes among the poor. Another case study is that of Zambia, which has relatively high urbanization for the region. Periods of severe economic hardship in the early and mid-1990s were accompanied by increasing childhood

mortality. This increase in mortality was observed among the urban population, particularly among the urban poor. In sub-Saharan Africa, the growing poverty and poor-rich fertility gap will result in greater proportions of children increasingly born to poorer families, with predictable implications for future population growth and the attainment of the health MDGs.

Rapid rate of urban population growth creates pressures on available infrastructure which, in many parts of Africa, have remained stagnant. The poor will increasingly lose out in such instances as the Kenya and Zambia case studies show. Consequently, the urban poor will experience many of the health challenges associated with lack of access to basic amenities and services. As many economies stagnate, the impact of this burden on the urban poor, combined with their growing size and proportion creates an overall worsening of health indicators across urban areas in sub-Saharan Africa (Tim and Lush, 1995). Where evidence exists, huge inequities are observed among the poor and non-poor in urban areas of sub-Saharan Africa (APHRC, 2002; Menon and others, 2000; Fotso, 2006).

Some of the findings of this study are rather counter-intuitive. For example, Tanzania and Malawi, and to a lesser extent, Madagascar, have higher rates of urban growth and lower improvement in access to safe drinking water and child vaccination. Yet, they display strong declines in child mortality. By contrast, Côte d'Ivoire has increasing mortality despite a noticeable increase in water supply and child vaccination. Country-specific policies and programmes may account for these results that are contrary to expectation. With support from various development partners, Madagascar has implemented sound strategies including vitamin A supplementation, de-worming, insecticide-treated bed nets and oral rehydration salts, among others, to reduce child mortality and morbidity (UNICEF); Malawi has put in place measures to address various child health and survival issues including developing nutrition rehabilitation strategies, providing insecticide-treated bed nets, and providing cholera treatment centres with essential drugs and other materials and training of health personnel on early detection and case management (National Statistical Office and UNICEF, 2007); and the Tanzanian government has shown consistent commitment to invest in health and decentralize decision-making for health spending based on district priorities (DFID).

F. STUDY LIMITATIONS

The study has some limitations. All retrospective survey data in general, and birth history data in particular, are subject to biases arising from faulty respondent recall, the most commonly incomplete and inaccurate birth dates; misreporting of age at death; death omissions, especially for infants who died early in life in the distant past; and survival bias since birth history data are limited to the experience of children born to surviving mothers (Bicego and Omar, 1996). Despite these limitations, several reports have indicated that the quality of DHS data to directly estimate infant and child mortality rates and to compare trends over time is generally good (Bicego and Omar, 1996; Curtis, 1995).

The paper presumes a constant rate of change in mortality, access to clean water and immunization coverage during the inter-survey period. This may not be the case in all countries. However, the constant rate approach has the advantage of summarizing in a single coefficient the change between the first and the last surveys. The study has other limitations, including the exclusion of three or four outliers (out of 22 countries) in the correlation analysis, which represents a non-negligible proportion. For example, the strong association between trend in child vaccination and change in mortality ($r = -0.73$; $p < 0.00$) is substantially weakened if the three outliers (Côte d'Ivoire, Malawi and Uganda) are included in the analysis ($r = -0.42$; $p < 0.10$). The analysis does not take into account the standard errors of the estimates in the calculation of percentage change over time in each of the indicators. Since DHS surveys are based on population samples, some of the differences presented may not be statistically significant. Variance estimation of mortality rates requires the use of specialized software to perform complex calculations (i.e. Jackknife repeated replication methods), which was beyond the scope of the study.

Another limitation of the study is that identification of slum areas in DHS samples is not straightforward. In addition, urban samples are often small so that trying to isolate intra-urban differences can sometimes be problematic. The estimates that we present of slum childhood mortality and vaccination rates are based on our definition of slums (absence of a flush toilet), which may not be fully accurate. The NCSS was a representative survey of slum households in Nairobi and our assertion of the disadvantage of slum children compared even with rural children is strengthened by that survey's findings. We recommend that NCSS-type surveys should be undertaken periodically to provide good data for the study of intra-urban health differentials. Finally, the effects of HIV and AIDS are not included in the analysis, as previously indicated.

G. CONCLUSION

Overall, the results of this analysis suggest that the urban poor should not be neglected in policy making and resource allocation. While the poorest families and neighbourhoods are the most likely to need interventions to prevent illnesses in children, existing evidence from sub-Saharan Africa suggests that they are often the least likely to receive them, which not only adversely affects the health and survival of their children, but also pushes them further into indebtedness and poverty (Wagstaff and Bustreo, 2004). Failing to appropriately target the growing sub-group of the urban poor and improve their living conditions and health status—which is an MDG target itself—may result in lack of improvement in national health indicators. This may consequently move countries further away from achieving the MDGs. In addition to improving the overall urban and national averages of health indicators, it is important to analyse, track and purposefully reduce health inequities—inequalities that are unjust and unfair, and ethically indefensible (Victora and others, 2003; Zere and McIntyre, 2003; WHO, 2000), since progress towards the achievement of the health MDGs will not automatically benefit the underprivileged population sub-groups (Wagstaff and Bustreo, 2004; Wirth and others, 2006). The concern for equity therefore applies even to countries witnessing a substantial decline in child mortality. Progressive and sustained expansion of access to safe water supplies and vaccination coverage among disadvantaged urban dwellers, will contribute greatly to reducing under-five mortality in urban sub-Saharan Africa, and consequently, put countries on track to meeting the MDG 4 target. Implementing these interventions could be a measure of the attention paid by governments and development partners towards equity in providing health-related services.

Competing interests

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Authors' contributions

Jean-Christophe Fotso framed the research question, conducted the literature review, led in the data analysis, contributed in the writing of the paper. Alex Chika Ezech conceived the idea of this paper and provided the overall guidance for the write-up. Nyovani Janet Madise contributed in the data analysis and in the writing of the manuscript. James Ciera was responsible for collating data for the study and also contributed in the data analysis. All authors read and approved the final manuscript.

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Part Six
Urban planning and governance

THE PLANNING AND GOVERNANCE OF ASIA'S MEGA-URBAN REGIONS

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A. ASIA'S MEGA-URBAN REGIONS

By 2010, 11 of the 20 urban centers with 10 million or more inhabitants in the world are expected to be in Asia. Tokyo, the largest of these “mega-cities”, is projected to have a population of 36.0 million, followed by Mumbai (20.0 million), Delhi (17.0 million), Shanghai (15.7 million), Kolkata (15.5 million), Dhaka (14.8 million), Karachi (13.0 million), Beijing (11.7 million), Manila (11.6 million), Osaka-Kobe (11.3 million), and Istanbul (10.5 million). By 2015, Jakarta with a population of 10.8 million and Guangzhou with 10.4 million, may also qualify as mega-cities. Not too far behind are ten other Asian cities with large populations including Seoul (9.7 million), Shenzhen (8.9 million), Chennai (8.3 million), Lahore (8.1 million), Wuhan (8.1 million), Tianjin (8.1 million), Bangalore (7.9 million), Hong Kong (7.7 million), Bangkok (7.3 million) and Hyderabad (7.4 million) (United Nations, 2008).

The population figures for the mega-cities mentioned above are based on official country definitions confined to formal political boundaries. However, it is now increasingly recognised by researchers and government authorities that the actual “urban field” of economic, social and technological influences of mega-cities extends way beyond their formal boundaries. As described by John Friedmann (1992) “urban fields typically extend outward from the city core to a distance of more than 100 km; they include the city’s airport, new industrial estates, watersheds, recreation areas, water and sewerage treatment facilities, intensive vegetable farms, outlying new urban districts, already existing smaller cities, power plants, petroleum refineries, and so forth, all of which are essential to the city’s smooth functioning. City-regions on this scale can now have millions of inhabitants, some of them rivalling medium-sized countries. This space of functional/economic relations may fall entirely within a single political/administrative space (...) More likely, however, it will cut across and overlap with a number of (...) political-administrative spaces of cities, counties, districts, towns, provinces, etc.” (Friedmann, 1992, p. 17).

McGee (1995), noting the unique feature of Asian urban agglomerations, has coined the term *desakota* development to describe their growth, combining the Bahasa terms *desa* (village) and *kota* (city) to indicate their mixed rural-urban characteristics. He observed that these city-regions tend to “produce an amorphous and amoeba-like spatial form, with no set boundaries or geographic extent and along regional peripheries; their radii sometimes stretching 75 to 100 km from the urban core. The entire territory – comprising the central city, the developments within the transportation corridors, the satellite towns and other projects in the peri-urban fringe and the other zones – is emerging as a single, economically integrated “mega-urban region” or “extended metropolitan region” (McGee, 1995, p.5).

Following Friedmann and McGee, Laquian (2005) noted that most Asian mega-cities have expanded into mega-urban regions that encompass much larger territories and populations. Despite governmental efforts to restrict or even reverse the growth of mega-cities by using various administrative and economic measures (for instance, internal passport systems that limit benefits to *bona fide* urban residents in China and Viet Nam; use of green belts to confine growth within highly urbanized areas in India and Malaysia; eviction and resettlement of inner city dwellers to outlying areas in the Philippines and Bangladesh; and transmigration schemes to move urban residents to frontier areas in Indonesia) mega-urban regions have continued to grow. While some inner city areas have lost populations because of out-migration and forcible eviction, suburban and exurban areas around mega-cities have continued to grow. This

“spreading pancake” or “palm and fingers” expansion pattern has engulfed small towns, cities and other settlements in the urban periphery, joined the urban fields of other large cities, and formed city clusters or sprawling mega-urban regions (Laquian, 2005).

The proper definition of mega-urban regions, of course, is not an easy task. However, it may be possible in the future to go beyond formal country definitions of urban agglomerations by using technological tools such as geographic information systems (GIS) and satellite imagery to determine the actual extent of urban built-up areas that make up mega-urban regions. This is particularly important because of the rapidly rising urbanization levels in many developing countries, the blurring of urban-rural distinctions, and the emergence of city clusters. For urban planning and governance purposes, there is a need to go beyond the demographic and spatial features of urban agglomerations and to fully consider the complex economic, social, political and technological processes and linkages involved in what has been called “urbanism as a way of life” (Wirth, 1938).

This change of perspective is called for in light of the increasing influence of globalisation forces that are transforming the functioning and structure of mega-urban regions. This paper analyzes the growth of mega-urban regions in Asia and suggests a typology that may be useful for classifying them. It explores the various issues confronting their development and then suggests various planning and governance approaches that may enhance their positive role in regional and national development.

1. Types of mega-urban regions

Based on their demographic, geographic and socio-economic characteristics, mega-urban regions in Asia can be classified broadly into three distinct types:

- (a) *Urban corridors* such as the Tokyo-Yokohama-Nagoya-Osaka-Kobe-Kyoto *Shinkansen* or “bullet train” corridor in Japan; the Beijing-Tianjin-Tangshan-Qinhuangdao transport corridor in Northeast China; or the Mumbai-Pune development corridor in India.
- (b) *Mega-city dominated city-regions* such as Metro Manila in the Philippines, the Jakarta-Bogor-Tangerang-Bekasi (JABOTABEK) region in Indonesia; the Bangkok-centred region in Thailand; or the Dhaka metropolitan region in Bangladesh; and
- (c) *Sub-national city clusters* such as the Guangzhou-Shenzhen-Hong Kong SAR of China-Macao SAR of China-Zhuhai region in the Pearl River Delta in southern China; the Surabaya-Surakarta-Semarang-Yogyakarta-Malang region in Indonesia; or the Daegu-Ulsan-Busan-Gwangju region in the Republic of Korea.

a. Urban corridors

Urban corridors are contiguous highly urbanized human settlements linked together by trunk urban infrastructure and services. In some ways, they are similar to the “megapolis” described in *Megalopolis: The Urbanized Northeastern Seaboard of the United States* (Gottmann, 1961) that stretches from Washington, DC to New York and Boston. The best example of an Asian urban corridor is the *Shinkansen* or “bullet train” region on the main Japanese island of Honshu. The combined population of the mega-cities within this *Shinkansen* corridor has been estimated at about 60.6 million and, if the surrounding urban wards, cities and districts within the prefectures are included, it could easily exceed 70 million.

The Jing-Jin-Tang expressway that links Beijing, Tianjin, Tangshan and Qinhuangdao and connects China's national capital to the port of Tanggu on the Gulf of Bohai is the major urban corridor in China. Along this main corridor, nine special economic development zones are found – science parks, hi-tech development enclaves and research and development centres. Also within this corridor are two major cities under the direct jurisdiction of the central government (Beijing and Tianjin), two intermediate-sized cities (Tangshan and Langfang) and hundreds of county seats and designated towns. The region's population has been estimated at about 56.4 million.

b. Mega-city dominated city-regions

Most of the mega-city dominated regions are found in Southeast Asia where urbanization is marked by primacy where the main city, usually the national capital, is many times larger than the next largest city. The Metro Manila national capital region, for example, is formally defined as including 22 chartered cities and the municipality of Pateros in Rizal province with a metropolitan area population of 11.7 million. However, Philippine urban planners argue that a comprehensive development plan for the national capital region should encompass a whole region covering seven provinces in Central Luzon (Rizal, Bulacan, Pampanga, Tarlac, Nueva Ecija, Pangasinan and Zambales), the three Southern Luzon provinces of Cavite: Laguna, Batangas and Quezon (CALABARZON), and the island provinces of Mindoro, Marinduque, Romblon and Palawan (MIMAROPA). This extended city-region has been referred to as Mega-Manila by Filipino mass media and marketing specialists who recognise the actual geographic extent and socio-economic influence of the mega-urban region.

c. Sub-national city clusters

In countries with very large populations and wide national territories, a number of sub-national city clusters have evolved as mega-urban regions. In the Pearl River Delta of China, for example, the concurrent growth of cities like Guangzhou, Shenzhen, Hong Kong special administrative region (SAR) of China, Macao special administrative region (SAR) of China, and Zhuhai has created the potential for a "southern China megalopolis." These clustered-cities' development pattern includes a city under the jurisdiction of the national government (Guangzhou), a sub-provincial city also under the jurisdiction of the central government that is also a special economic zone (Shenzhen), two former colonial enclaves absorbed by China as special administrative regions (Hong Kong and Macao) and a special economic zone (Zhuhai). By 2021, Hong Kong based planners have projected the emergence of a poly-nucleated mega-urban region in the "Greater Pearl River Delta Region" with a population of 51 million, 18 per cent of which will be in Hong Kong (Enright and others, 2003).

2. Characteristics of mega-urban regions

Although Asian mega-urban regions represent a wide range of human settlements, they share a number of common characteristics. First is their wide land area coverage and large population size. For example, the Beijing-Tianjin-Tangshan-Qinhuangdao corridor covers about 168,000 sq km and has a population of about 56.4 million. The six mega-cities that make up the "bullet train corridor" in Japan have a combined population of at least 60.6 million. In Southern China, the sub-national urban cluster of Shanghai-Nanjing-Suzhou-Changzhou-Zhenjiang-Nantong-Yangzhou-Wuxi in the Yangtze River Delta had a population of 72.7 million in 1995 (Shi, Lin and Liang, 1996) and the Guangzhou-Shenzhen-Hong Kong SAR of China-Macao SAR of China-Zhuhai region in China had a population of 40 million in 2003 (Enright and others, 2003).

Moreover, some Asian mega-cities are continuing to grow at higher than the average annual urban growth rate of 2.4 per cent. Dhaka, for example, grew at an annual rate of 7.1 per cent between

1985 and 1995, continued to grow at 4.9 per cent in 1995-2005, and is projected to grow at 3.2 per cent in 2005-2015 (United Nations, 2006). Other Asian mega-cities with high annual growth rates in 1995-2005 were Hyderabad (4.0 per cent), Karachi (3.7 per cent), and Jakarta (3.6 per cent). These mega-cities are bursting their boundaries, jumping their confining greenbelts and becoming mega-urban regions (UNCHS, 2005).

Second, the “fields” of influence of mega-urban regions encompass both urban and rural areas. As pointed out by McGee (1995), *desakota* development in the Greater Jakarta area has expanded beyond the boundaries of the Special Capital Region of Jakarta with its population of 11.4 million and includes rural sectors within the regencies of Bogor, Tangerang and Bekasi (McGee 1995, p. 5). Two Indonesian planners have even suggested that the Jakarta-centred region should actually include Bandung and the largely rural regencies (*kabupatens*) around it. If this is done, the JABOTABEK cum Bandung mega-urban region would have a population of 26 million, with 6.9 per cent living outside the urban built-up areas (Dharmapadni and Firman, 1995).

As mega-urban regions expand, they engulf towns and cities in the urban periphery. For example, the Bangkok Metropolitan Area (BMA) had a population of only 4.7 million in 1980. However, the rapid expansion of the city covered areas within the provinces of Pathum Thani, Nontaburi, Samut Prakan, Samut Sakhon and Nakhon Pathom so, in 1988, the Bangkok Metropolitan Region (BMR) was created to plan and manage a city-region with a population estimated at 8.5 million. The United Nations, in its *World Urbanization Prospects: The 2007 Revision*, projected the population of Greater Bangkok to reach only 6.9 million by 2010. As early as 1990, however, the National Economic and Social Development Board of Thailand had formulated plans for an “extended BMR” with a population of 17 million by 2010. The city-region included parts of the provinces of Ayutthaya, Saraburi, Chachoengsao, Chonburi and Rayong (National Economic and Social Development Board, 1990).

Third and finally, despite the obvious economic and technological interrelationships among the urban places within the mega-urban region, there is usually no overall political or administrative structure with overarching authority for comprehensive planning or governance. Even in the highly developed city-regions of Japan, governance mechanisms in the Tokyo to Osaka-Kobe development corridor are terribly fragmented. The city of Tokyo is made up of 23 special wards (*ku*), 23 cities (*shi*), five towns (*cho or machi*), and eight villages (*son or mura*). Each one of these local units has its own local government. The Greater Tokyo area includes the city and prefecture of Tokyo as well as parts of Kanagawa, Saitama, Chiba, Gunma, Tochigi, Ibaraki and Yamanashi prefectures. Greater Tokyo also includes 26 cities within Tokyo prefecture, the Tama area also known as Western Tokyo and the islands of Izu and Ogasawara. Functionally, the city of Yokohama, capital of Kanagawa prefecture with a population of 3.6 million is well integrated with Tokyo Metropolis but is a separate local unit. The same governmental fragmentation is also found in Osaka, with its 23 wards and Kobe with its nine wards.

B. PLANNING ASIAN MEGA-URBAN REGIONS

The emergence of mega-urban regions in Asia has posed a number of challenges to city and regional planning. First, the traditional instrument for development of Asian cities has been physical planning that is designed to control and guide the material elements in cities and towns (for instance, roads and transportation networks, waterworks, drainage, sewerage and sanitation systems, energy generation and distribution, garbage dumps, landfills and incinerators, housing, etc.). This approach is usually confined to “hardware” elements and fails to take into consideration the economic and social processes (“software”) that often exert stronger influences on the development of city-regions.

Second, there is a shortage of planners who are adequately trained in comprehensive planning and who take economic, social and environmental factors into consideration when formulating city-region

plans. Most city and regional planners in Asia are architects, engineers, surveyors and other technically-oriented individuals who often fail to appreciate the important role played by socio-economic processes in urban life. As observed by a former World Bank economist, most big city problems in developing countries may be traced to “wrong headed national urbanization policies promoted by physical planners with visions of optimal geography and very little sense of economics” (Hamer, 1994).

Third, urban and regional planning in Asia is deeply influenced by the concept of the rural-urban dichotomy. Many government officials as well as staff members of multilateral and bilateral aid agencies firmly believe that the main issue in Asia is rural development and that the solution to alleviating absolute poverty is improving agricultural productivity, building farm to market roads, instituting land reform schemes and encouraging farm mechanization. This belief persists despite the fact that about 41.0 per cent of Asia’s population is already living in cities and towns and that by 2030, 54.1 per cent of the population is projected to be urban (United Nations, 2007). Many policymakers are slow to acknowledge that rural improvements do not keep people on the farm and that in fact, once the economic and social situation of rural dwellers improve, they tend to migrate to urban areas. As shown in North America and Europe, people will stay in villages only if the full benefits of urbanization are made available to them in their villages.

Fourth, the legal and institutional basis for local governance in Asia upholds decentralisation and local autonomy. Because of this, urban areas suffer from extreme fragmentation among competing local jurisdictions. They are fragmented sectorally as line agencies in charge of functions such as transport, energy generation, water and sewerage, jealously guard their respective turf. They are also fragmented hierarchically as agencies are organized at the district, town, city, prefecture, province and national levels. The fragmentation is often complicated by the creation of special authorities that look after specific functions such as railways, flood control, and ports and harbours that are designed to cut across jurisdictional lines but end up being autonomous agencies themselves. Because of extreme fragmentation, urban plans are confined to the formal boundaries of municipalities or metropolitan areas. Legal ordinances, zoning codes and land use rules and regulations promulgated by city councils and municipal boards are applicable only within their jurisdictional areas. As cities have become mega-cities and then evolved into mega-urban regions, traditional planning approaches have not kept pace with substantive and technical developments.

Finally, most city-region plans in Asian agglomerations are not formally adopted as legally binding enactments—many are primarily conceptual and regarded as “indicative guidelines” for the future development of mega-urban regions. This phenomenon is mainly due to the legalistic tradition that vests authority for planning and enactment of zoning codes and land use regulations in cities or municipalities that have their own specific charters. In India, for example, the 74th amendment to the Constitution decentralised authority to local government bodies. In the Philippines, the 1987 Constitution makes the creation of metropolitan governments extremely difficult because it requires voluntary consent of local units and the Local Government Code of 1991 and its amendments in 2007 continue to uphold local autonomy.

1. City and regional planning approaches

Historically, city and regional planners in Asia have utilised various approaches, such as classical city planning, colonial city planning, socialist planning and comprehensive strategic planning. Each one of these planning approaches has been based on specific assumptions, objectives and procedures. For example, classical city planning was essentially a component of rites and rituals extolling the divine rights of emperors. Colonial city planning simply tried to replicate in Asian colonies planning ideas and practices in the home country. Socialist planning was based on the assumption that future conditions were knowable and could be manipulated to achieve specific conditions. Comprehensive strategic planning, in

turn, integrates socio-economic with physical planning elements and uses an iterative approach to get to targeted objectives.

a. Classical city planning

Cities in Asia have been planned and built for more than 3,000 years. Chinese cities like Chang'an (present day Xian), Luoyang and Shenyang were planned in accordance with classical principles based on the divine nature of the emperor, the metaphysical influence of wind and water (*feng shui*) and admixtures of Buddhist, Taoist, and Confucian traditions. Although the Chinese capital of Beijing is relatively new in the millennial context of Chinese history, the plans for the city are said to be derived from guidelines prescribed in the Zhou Li, which explicitly set down the principles and prescribed rites for city building practiced during the Zhou Dynasty (1051-403 B.C.) (Wright, 1977; Wu, 1999).

The key elements of Chinese classical city planning included four basic principles. First, the main axis of a city's structure had to be rigidly oriented in a north-south alignment directly oriented to the North Star. Second, the city had to be bounded by a city wall formed as a square or a rectangle. Third, the classical city building treatises demanded strict compliance with precise instructions on issues such as how many gates the city should have, the alignment of streets along a geometric grid, the balanced location of public buildings, temples and residences, and the provision of parks and open spaces. Finally, the exact location of a city as well as the time for initiating its construction were determined by prescribed rituals, usually tortoise shell divination ordered by the emperor. The physical structure of the classically planned Chinese city, therefore, had the imperial palace within the imperial city as the centre of everything. From this core, the emperor's powers radiated outward in the form of the imperial city, the important role of China as the "middle kingdom" and the position of the country in the world and the whole universe.

The same adherence to religious precepts governed the establishment of cities and towns in the Indus River Valley. Archaeologists have suggested that the plans for Mohenjo-daro and Harappa reflected cosmological efforts to establish on earth an idealised notion of the universe. The Khmer cities and temples of Angkor Wat and Angkor Tom as well as the urbanized centres of Hinduized kingdoms in Indonesia (Borobudur) were also planned along cosmological lines. There have even been suggestions that the original plan for old Delhi was derived from the mythical city of Indraprastha, the capital of the Pandavas in the Mahabharata epic.

b. Colonial city planning

Through the centuries, of course, the planning and establishment of cities in Asia have been influenced by many factors. The physical features of most present-day Asian cities bear the marks of colonial rule by Western powers. In the Philippines, the walled city of Intramuros in Manila and the military forts in cities like Cebu and Zamboanga reflect the country's Spanish heritage. The so-called "plaza complex" town plan focused on the parade grounds around which are found the Catholic church, the residence of the governor, the municipal hall, the military barracks, the jail, and the grand houses of elite families. Similar colonial structures are found in many Indian cities, like Delhi with its Red Fort and Mumbai with its Maidan. In Indonesia, Dutch planners even tried to replicate their cities and towns in the colonies, right down to the canal networks in Jakarta that were copied from those in Amsterdam.

In the 19th century, city and regional planning in Asia was greatly influenced by British and American concepts and approaches. First, there was the "garden city" idea of Ebenezer Howard who envisioned an ideal city based on agricultural production, industry and commerce that would retain its closeness to nature. This garden city plan was followed in the establishment of New Delhi by architects led by Edwin Lutyens. It also influenced the planning of Bangalore and Singapore. The second important

influence on Asian city planning came from the United States, mainly through the work of the Chicago-based architect David H. Burnham. In making the master plan for Manila and the Philippine summer capital of Baguio, Burnham was inspired by the L'Enfant plans for Washington, D.C. that featured wide boulevards lined by monumental buildings.

A major shortcoming of the colonial city plans mentioned above was that they were essentially elitist because they mainly catered to the production, welfare and comfort needs of the colonists. The plans ignored the organic nature of communities and cities. They did not take into consideration indigenous architecture, the use of local building materials, native construction techniques or the aesthetic values of the Asian populations. As such, the colonial enclaves became the original “gated communities” that were physically and functionally separated from the indigenous city. When national elites took over the colonial enclaves after independence, however, the operation and maintenance of the urban infrastructure and services were not continued, generating inner city decay and dilapidation that characterize many Asian cities today.

c. Socialist city planning

It is interesting that in China and Viet Nam, the transition from classical city planning to socialist planning happened with apparent ease, because both planning processes were based on a “top down” approach. In ancient times, the planning authority came from the ruler and divine rites while in socialist planning, it emanated from the State. Socialist planning was based on the premise that aspired for future conditions could be set, for example, by 2025, Hanoi would have a population of five million, per capita GDP of \$800 per year, and each resident would have 12 sq m of living space, etc. From these targets, the planners simply calculated the material, financial and institutional resources required. However, because historical events did not usually unfold according to expectations, socialist planning encountered many pitfalls.

Socialist planning did have at least two salutary effects. First, the strong emphasis on providing urban infrastructure and services in cities helped the residents a lot. The concentration on heavy industries also provided useful outputs and employment to people although it generated serious environmental pollution. The location of housing adjacent to factories and other work sites cut down on travel time. Making work units responsible for the welfare benefits of their workers also ensured amenities needed for basic needs.

The other major benefit from socialist planning involved the State’s commitment to improving the lives of citizens and other underprivileged groups. Housing projects, schools, hospitals, senior citizens’ homes and other social services institutions were built. Subsidized grain, cooking oil, and other basic needs were provided to urban residents. The human capital generated by policies and programmes carried out under socialist planning may be regarded as mainly responsible for the tremendous progress currently being achieved in the transitional economies of China and Viet Nam.

d. Comprehensive strategic planning

Unlike traditional planning approaches that focused on the physical structure of the city, comprehensive strategic planning (CSP) encompasses economic, social, and technological aspects of urban growth. Thus, it is concerned with population growth, internal and international migration, people’s productive behaviour, trade and commerce, and social and cultural activities that determine the shape and geographic extent of the mega-urban region.

CSP is based on the idea that urban centres are the engines of development and they should be planned and managed to make them run in an efficient and sustainable manner. If urban centres are

planned and managed properly, they can act as “transformational agents” that can energize whole countries. To achieve this, CSP calls for a holistic approach instead of segmented sectoral interventions. People’s productive activities, their travel habits, what they buy and where, and what leisure and cultural activities they pursue have spatial implications.

It is not surprising then, that CSP has been mainly adopted in market-oriented countries like Indonesia, Malaysia, India and the Philippines. As used in these countries, CSP has the following characteristics: (a) it covers not just individual cities or metropolitan areas but whole city-regions; (b) it is concerned with the full gamut of economic, social and environmental activities in the whole city-region; (c) it follows an iterative rather than a linear process which involves regular and periodic assessments and updating of planned activities based on feedback information gathered through monitoring and evaluation mechanisms; (d) it is formulated on the basis of inputs from citizens and concerned stakeholders who actively articulate their stand on key issues; and (e) it includes financing, management and governance provisions in the plan. In other words, the CSP does not draw a sharp distinction between the formulation and the implementation processes, both are considered necessary elements of the plan.

Despite the attractiveness of CSP, some Asian countries have encountered difficulties in adopting it. First, the approach requires voluminous amounts of data that are not readily available because of the limited data gathering and statistical approaches currently available in governmental and private sector systems. Second, there is a severe shortage of urban and regional planners with the appropriate training to use the approach successfully. Finally, high-level political officials and administrators seldom have the patience and tolerance level to wait for the proper formulation, adoption, and implementation of comprehensive plans. Their short-term perspective and narrow political objectives, therefore, make the adoption of CSP problematic.

2. Issues in mega-urban region planning

As more mega-urban regions emerge in Asia, planning authorities face a number of problems created by their size and continued expansion. These are: (a) the decay and deterioration of inner city areas; (b) urban sprawl and uncontrolled peripheral area development; and (c) environmental pollution. A number of measures have been adopted by some urban authorities to deal with these problems but the accelerating pace of mega-urban expansion indicates the need for more effective interventionist policies and programmes.

a. Inner city redevelopment

Unlike their Western counterparts, mega-cities in Asia tend to have thriving inner city areas where old-time residents live in active and vibrant communities. Because the inner city areas are the oldest parts of the city, they are subject to physical deterioration and decay. Basic services like water supply, drainage, sewerage and sanitation originally installed when the cities were first set up have become inadequate. Narrow streets and lanes built before the coming of the private automobile constrict mobility and make solid waste collection and firefighting extremely difficult. As inner city areas have deteriorated physically, they have attracted urban poor residents seeking cheaper rent. Many inner city areas have also become notorious as centres for crime, juvenile delinquency, drugs and prostitution.

Fortunately, the strong community ties among inner city dwellers in Asia have made it difficult for government authorities to simply use the “bulldozer” approach. Inner city squatters and slum dwellers have tenaciously fought campaigns to evict them or dump them into relocation sites on the urban periphery. In Chinese cities, there are programmes to redevelop “dangerous and dilapidated houses” through community upgrading that maintains the traditional structures instead of demolishing and replacing them with high-rise apartments. In Indonesian cities, the Kampung Improvement Programme

(KIP) provides basic services like potable water, sanitary toilets, electricity and pathways, but leaves the construction, repair and maintenance of dwellings to individual households. In most Asian countries, laws have been enacted prohibiting eviction of people from their communities without providing them with housing and other amenities that are acceptable to them. These have slowed down some inner city redevelopment schemes but served to avoid confrontations and at times violent incidents with urban poor groups.

Some Asian countries have adopted development schemes that seek to balance inner city redevelopment with peripheral area growth. In Beijing, Shanghai, Guangzhou and other large cities in China, public/private development companies have cleared sections of inner city areas and built hotels, luxury condominiums, offices and commercial and tourism-related malls. These urban renewal schemes usually required the resettlement of inner city inhabitants to high-rise apartments in suburban areas. The families who choose to remain in the inner city are provided housing in new apartments or upgraded traditional courtyard houses. Those who agree to move to suburban areas are provided with larger apartments equipped with individual toilets, kitchens, balconies, electricity, gas and other amenities. Both new apartments and upgraded homes in the inner city and the suburbs are financed by cross-subsidies from profits earned by the development companies from their up-market ventures and the private sale of the units to individual households who are extended low-interest loans by banks and mortgage companies.

In other Asian cities, tourism development has been used as an instrument for redeveloping inner city areas. In Bangkok, for example, the area around the imperial palace and the temple of the Jade Buddha have been preserved and maintained to reflect traditional architecture and Thai community life. In Hanoi, a cultural conservation scheme for the area known as the “36 Ancient Streets” preserves the tree-lined lanes and the old “tube houses” that served both as residences and work places for families belonging to ancient craft guilds. Also, the preservation of old trees, traditional homes and small shops around Hoang Khiem Lake maintains the cultural atmosphere of the area even as it has become the city’s most popular tourist destination. In ultra-modern cities like Tokyo, Kyoto, Nagoya and Kobe, the pleasant atmosphere around palaces, temples and shrines in inner city areas have served as the main attractions to tourists and residents alike.

b. Controlling urban sprawl and developing peripheral areas

Most Asian cities do not yet have the huge number of private automobiles that have caused urban sprawl in most North American cities. However, as household incomes rise and globalisation generates a revolution of rising expectations, the demand for private cars is escalating. Asian planners are now engaged in a frantic race to come up with measures to prevent what occurred in North America from happening in Asia. Some of the measures they have used to control urban sprawl include: (a) planned development of self-contained industrial estates, hi-tech zones, special economic zones and other productive enclaves to concentrate growth in selected urban nodes within the mega-urban region; (b) construction of trunk infrastructure systems linking clustered cities together; (c) preserving agricultural land and open spaces; (d) encouraging the establishment of high-density settlements where people can live, work, shop, and have access to cultural activities; and (e) creating area-wide metropolitan planning committees with open stakeholder participation.

China has adopted as part of its national urban development strategy, the establishment of 5 special economic zones (Shantou, Shenzhen, Zhuhai, Xiamen and Hainan Island), 14 “open coastal cities,” and 3 “open economic regions” (in the Pearl River Delta in Guangdong province, the Yangtze River Delta around Shanghai and Jiangsu provinces, and the Minnan Delta in Fujian province). Special Economic Zones (SEZs) are small areas “demarcated within a country’s territory and suitably insulated for adopting special and flexible policies to attract and encourage foreign investment in industrial and other economic activities” (Yee, 1992). In Shenzhen, for example, the government built a whole city from

scratch, transforming a fishing village of 3 sq km and a population of 30,000 to a mega-city of 2,022 sq km with a population of 9.1 million. Shenzhen has attracted investments from local interest such as Hong Kong SAR of China, and from external investors like Japan, Korea, the United States and Canada. Even as it developed into a compact urban region, it has served to energize surrounding urban nodes like Dongguan, Foshan, Zhongshan and Huizhou. It has also sparked visions of a Southern China megalopolis linking it with Hong Kong SAR of China, Macao SAR of China, Zhuhai and Guangzhou (Laquian, 2006).

India's largest city, Mumbai, with a population of about 20 million, has adopted a regional plan to control urban sprawl. As early as the 1960s, Mumbai's planners had proposed a new settlement across the harbour called New Mumbai. Focused on the development of the port in Nava Sheva, the plan was designed to concentrate industrial and manufacturing activities so as to form a "counter magnet" to the old city (Jain, 1996). New Mumbai was established in 1972 as the largest new planned city in the world with a total land area of 344 sq km. Two bridges were built to connect New Mumbai with the old city and railway links were established with other urban nodes. In 2001, the new city had a population of 1.5 million, according to the 2001 census.

An ambitious scheme to control urban sprawl in Malaysia involves the creation of two "intelligent cities" linked to Kuala Lumpur by massive infrastructure facilities—Putrajaya and Cyberjaya. Putrajaya is being built on a green field site about 25 km from Kuala Lumpur, where some 500,000 people are expected to be residing by 2010. Some 53 per cent of the buildings will be for government activities, 29 per cent for commercial use and the rest for private residences and services. About 38 per cent of the city's land area will be devoted to green spaces and wetlands. Cyberjaya, Malaysia's centre for high-technology is 5 km from Putrajaya. It covers an area of 2,894 ha and its development is estimated to cost \$5.3 billion. It is linked to Kuala Lumpur by the Shah Alam Expressway. As a settlement fully devoted to hi-tech development, Cyberjaya has a national fibre-optic backbone, broadband connectivity to all buildings, wireless hi-fi spot services in all public areas, local online electronic commerce portals and "smart" homes and schools (Yuen, Ahmad and Chin, 2006).

c. Dealing with environmental pollution

Environmental pollution does not recognise political boundaries and planning measures to prevent and control it demand area-wide authority. For example, one of the major costs of rapid development in the Pearl River Delta (PRD) has been air and water pollution. The air quality in both Hong Kong SAR of China and Shenzhen has become a real problem. The Dongjiang River is the main source of water for both mega-cities, but the rise of local industry and the rapid growth of urban settlements along the river have caused serious contamination. However, it has been extremely difficult to control this. To some extent, the lack of attention to pollution problems has been attributed by one study, to political fragmentation among local units. From the point of view of a local unit, it does not make sense to impose fines on local polluters if other units are not doing this. Also, pollution fines in the PRD are relatively low, so industries find it easier to pay the fines rather than curtail their productivity (Enright and others, 2003).

Unfortunately, while many Asian governments have promulgated environmental laws, enforcement of such laws has been a problem. To some extent, this is due to lack of technically qualified personnel who can clearly prove legal violations. Although environmental auditing and "green reporting" techniques have been developed in technologically advanced countries, these are not yet well known in Asia. Ideally, public and private agencies setting up urban projects together with domestic and foreign institutions financing such projects are legally liable for environmental damages. However, weak technical capabilities together with graft and corruption make such actions incredibly difficult to prosecute.

3. Resolving city region planning issues

It is obvious from a careful study of urban planning in Asia, that traditional approaches such as physical planning and the formulation of elaborate “master plans” are inadequate to face up to the many problems that mega-urban regions face. To make city and regional planning in the region more relevant to future development it needs to have the following elements:

- A future vision or desired goals to be achieved within a specified time period (short, medium or long term);
- A systematised process of choosing among various options to attain the desired vision;
- Specification of material, financial, human and organizational resources needed for plan execution and ways to mobilise such resources; and
- Processes and procedures for monitoring and evaluation to ensure that course corrections can be made based on information feedback.

An assessment of city-region plans of many Asian mega-urban regions reveals that the most common vision held by key leaders is to achieve “global city” or “world class status.” This is seen in the development plans for Shanghai that is focused on the Pudong New Area, a 522 km² zone on the eastern banks of the Huangpu River. When Pudong was inaugurated in 1990, the stated goal was “transforming Shanghai into one of the leading economic, business and cultural centres of Asia and the world.” The vice mayor of Shanghai at the time said he accepted “the historical heavy burden of developing China’s largest metropolis into a world class city...and take the lead in setting up a socialist market economy with Chinese characteristics” (Pudong New Area Administration, 1991).

The grand visions embodied in city-region plans, however, are usually not matched by careful assessments of various options for achieving them. Most city-region plans rely on the building of physical infrastructure and services that reflect the grand visions despite the availability of less ostentatious alternatives. For example, no less than 24 rail-based rapid transit systems are currently under construction in Asian cities and another 10 are in the planning stages, despite the argument by many transport planners that such systems are very expensive to build, operate and maintain. The latest world-class transport mode preferred by top officials is the magnetic levitation (maglev) train capable of speeds of up to 900 km/hour. In 2002, Shanghai inaugurated the first operational high-speed conventional maglev train linking the downtown metro system to Pudong International Airport. The Chinese government has also approved another project for a maglev train system to Hangzhou to be finished by 2010. In Japan, there is a plan to build a maglev train system linking Tokyo to Osaka by way of Nagoya targeted for completion by 2025.

In India, rail-based rapid transit systems have been built in Mumbai, Delhi, Chennai and Kolkata, and new lines are currently under construction in Bangalore, Hyderabad, Mumbai and Thane. As pointed out by many Indian transport planners, however, the great bulk of transport users in Indian cities use bicycles, rickshaws and three-wheeled vehicles, and most of them cannot afford to pay rapid transit fares. Geetam Tiwari has proposed a fixed route bus rapid transit system for Delhi that will have the advantage of a rail-based system but will entail much lower cost. By integrating this bus rapid transit system with more traditional modes like walking, riding bicycles and rickshaws and three wheelers, Delhi can have a more cost-effective transport system (Tiwari, 2002).

To weigh various options to achieve planned goals, urban authorities in Asia have used various qualitative and quantitative methodologies such as cost-benefit analysis, cost-effectiveness analysis, and sensitivity analysis to assess the viability, effectiveness, efficiency and profitability of various options. They have also used tests of potential outcomes such as possible effects of projects on employment, capital investments, people's mobility and social class formation. Environmental and social impact analyses are also widely used in deciding what options to pick. One approach that has been used in Dhaka has been scenario building that was used to analyse the Metropolitan Area Integrated Urban Development Project. Scenario A focused on development of land close to the inner city providing for heavy investments for flood protection. Scenario B advocated land development in the urban periphery where localities were not subject to flooding. Scenario C also proposed developments in the northern and western suburbs where flooding was not a problem. For each of these three scenarios, the costs of land acquisition, flood control measures, roads and other infrastructure and operation and management were calculated. The expected benefits were also assessed, including employment creation, access to services, agricultural production and environmental improvement. After careful analysis of the costs and benefits, the planners concluded that a combination of Scenarios B and C were the most appropriate ones for the Dhaka city-region.

A common problem of mega-urban region plans in Asia is that they are great in expressing grand visions but terribly vague about what financial, material, human and institutional resources will be required to achieve their goals. In reality, most city and metropolitan governments in the region do not have adequate resources and from a third to more than half of their incomes are in the form of grants and their shares of tax revenues allocated by central governments. The potentials for relying on "user charges" to pay for urban infrastructure are quite limited because of the low income and capacity to pay of most citizens. In some Asian mega-urban regions, private-public partnership has been used to finance urban infrastructure and services and there have been quite a few successful cases showing the viability of this approach. Programmes and projects that have tapped the material and human energies of the people themselves in such schemes as garbage collection, composting, recycling and disposal as well as community-based sewage and sanitation schemes, have proven to be successful in cities like Dhaka and Karachi.

C. THE GOVERNANCE OF MEGA-URBAN REGIONS

The recent literature on urban governance has been mainly concerned with how public affairs in city-regions can be conducted effectively and efficiently. This is probably because most studies have been conducted in technologically advanced countries where provision of urban services is very important. In most Asian countries, however, city-regions are not just settlements that rely on efficient delivery of services; they are the engines of economic growth, the agents for transformation of societal values, the loci of authority and power, and the source of national leaders. Thus, the governance of Asian mega-urban regions goes beyond mere management of urban services. In the words of a recent study: "urban governance is the relationship between civil society and the state, between rulers and the ruled, the government and the governed" (McCarney and others, 1995). As such, it is concerned with political activities such as articulation of a common vision for the city-region, selection of political leaders, formulation and adoption of development policies and programmes, mobilisation of resources, and the implementation and evaluation of government programmes and projects.

1. Governance problems in mega-urban regions

a. Fragmentation and jurisdictional conflicts

Political and administrative fragmentation of local units in Asia is often related to the survival of indigenous local units that encourage a spirit of localism among the people (e.g., *barangays* in the Philippines, *kampung*s in Indonesia and Malaysia, *panchayats* in India, or *upazilas* in Bangladesh). Fragmentation is also a legacy of colonial governance structures such as municipal corporations, military cantonments, special service wards and development trusts. In national capitals, most urban functions are carried out by central government ministries, special purpose authorities or quasi-governmental corporations. The governance structure is also hierarchically fragmented at ward, district, municipal, metropolitan, prefecture, provincial and central levels.

In India, Bangladesh and Pakistan, the tradition of local autonomy is deeply rooted in indigenous local units, legal norms and political processes. Local leaders, often members of dominant families, try to preserve their bailiwicks and contribute to political fragmentation. Local governments jealously guard their autonomy and central government agencies are reluctant to devolve some of their functions to metropolitan bodies. In Dhaka, for example, proposals for metropolitan consolidation started as early as 1951 with the creation of the Dhaka Improvement Trust (DIT). The DIT was charged with formulating a regional master plan but political turmoil caused by Partition disrupted this process. After independence in 1971, the Dhaka Metropolitan Development Ordinance created another metropolitan authority, the Dhaka Municipal Authority (DMA). It was established in 1982 as a single metropolitan organization to govern the metropolitan area but local government leaders rejected the idea. The creation of RAJUK (Capital Development Authority) in 1987 revived the idea of a unified body to carry out planning and management functions but the agency's efforts failed. The main objections to metropolitan consolidation came from no less than 42 organizations operating in the metropolitan area including central government agencies (Ministry of Housing and Public Works, Ministry of Local Government), specialised boards (Dhaka Electric Supply Authority, Dhaka Water and Sewerage Authority), local government units (Dhaka City Corporation, Dhaka Cantonment Board), and traditional local units (*pourashavas* or municipalities and *upazilas* or rural sub-districts).

In the Philippines, metropolitan consolidation efforts were started in 1975 with the creation of the Metro Manila Commission (MMC). However, because the MMC was headed by the former First Lady, Mrs. Imelda Marcos, it was abolished in 1986 when the Marcos dictatorship was toppled. So strong was the antipathy to metropolitan governance that the 1987 Philippine Constitution, promulgated under former President Corazon Aquino, made the creation of metropolitan governments extremely difficult by requiring that such structures be established only upon the voluntary and complete concurrence of all local government units in the metropolitan area. The present Metro Manila Development Authority (MMDA) is weak and dependent on financial contributions of the 17 local governments in the national capital region. In 2002, the Chairman of the MMDA complained that the problem of flooding in Metro Manila could not be solved because of lack of cooperation of Mayors and City Councils. He complained that some Mayors did not even attend meetings of the MMDA Council but sent junior staff members instead (Laquian, 2002a).

b. Lack of financial capacity

Most local governments in Asia are dependent on tax revenue allocations, grants and other forms of financial assistance from central or provincial governments. The local revenue base is weak. Income from real estate taxes, the usual source of local government revenue is low—a study carried out for the Asian Development Bank found that most properties in Asian cities are under-assessed and that less than 5 per cent of property taxes are based on market value (Roberts and Kanaley, 2006). Most Asian

governments do not allow local government units to borrow from foreign and domestic sources for capital investments. Institutional and private sector investors are also hesitant to lend money for public infrastructure and services without national government (sovereign) guarantees, which governments are often reluctant to give. While public agencies provide urban services like water, sanitation and transport, cost recovery through user charges and fees is often inadequate. For example, a large proportion of potable water supplied in many Asian cities is unaccounted for. So-called non-revenue water (NRW) has been estimated at 62 per cent in Metro Manila, 53 per cent in Delhi and 51 per cent in Jakarta. The huge water loss is attributed to leakage from ancient pipes, unauthorised and illegal tapping of water mains and public standpipes and the non-payment of user charges by public and private enterprises (Brennan-Galvin, 2007).

c. Popular participation

Most Asian governments are committed to people's participation in public decision making but many local government theorists fear that urban governance structures on the scale of metropolitan areas or mega-urban regions are too big and too bureaucratic to make this possible. In India, for example, the 74th Amendment to the Constitution decentralised authority and powers to local governments in 1992. The amendment was designed to provide for a participative platform in metropolitan planning and governance. However, popular participation was focused on the establishment of urban wards because there was "a growing feeling that in the larger municipal bodies the citizens do not have easy access to the elected representatives since the ward sizes become very large." Cities with a population of more than one million were supposed to organize metropolitan planning committees where various stakeholders could participate in decision making but as of the middle of 2007, only the Kolkata Metropolitan Planning Committee had been established (Sivaramakrishnan, 2007).

Similarly, the Local Government Code of 1991 decentralized powers to local government units in the Philippines in an effort to encourage "grassroots democracy." However, like other decentralisation measures before it, the law devolved powers to units like the *barangay* or village council, municipalities and cities. These local units, however, did not have the financial, human or managerial resources to actually bring about positive development. The law was silent on the issue of setting up metropolitan or mega-urban governance arrangements, perhaps because the 1987 Constitution required that such units of governance required the common agreement of local government authorities to voluntarily create a federation of local units, a near-impossible move in a country where acute political partisanship at the local level is the norm (Laquian, 2002b).

d. Transparency and accountability

Because most urban infrastructure projects in mega-urban regions are "big ticket items", they offer excellent "rent seeking" opportunities for government officials. Although most governments have passed legislation to enhance transparency and accountability, graft and corruption continue to pose serious problems. The reasons for this are well known: (a) political officials have to spend large sums of money to win elections and they have to recoup these "investments" once they get elected; (b) administrators and civil servants receive low salaries and they are tempted to augment it by engaging in graft; (c) economic and political life in most cities is dominated by powerful families and "political dynasties" that remain in power by sharing rent seeking opportunities with petty leaders in their political machines; (d) military groups that have control over the official use of violence, gain political power and use these for economic advantages; and (e) the judiciary is often weak and also corrupted, thereby becoming ineffective in demanding accountability. Research on graft and corruption in Asia has revealed the complex cultural factors that underpin its prevalence. The strong kinship ties in Asian societies is said to encourage family and clan members to protect each other. The tradition of gift giving and reciprocal granting of favours makes it difficult to differentiate between gifts and bribes. A value system based on

avoiding shame and loss of face rather than suffering from guilt makes not getting caught a stronger motive than not doing something because it is wrong. Finally, the real or imagined belief that all officials (especially top level ones) are all corrupt encourages potential grafters.

In some Asian city-regions, of course, judicial reforms have helped in enhancing accountability and controlling corruption. In Hong Kong SAR of China, research on corruption found that one of the main reasons for this practice was the overly cumbersome process for deciding city affairs. The study found that when there are too many steps in decision-making, corruption is encouraged because each step opens up opportunities for rent seeking. Aside from streamlining bureaucratic processes, Hong Kong SAR of China, also created the Independent Commission against Corruption (ICAC) and gave it strong powers to punish erring officials. In Singapore, the certainty that corrupt acts are going to be punished and that sentencing would be done transparently and quickly have also served to inhibit corruption.

In the Philippines, a strong civil society and an unbridled mass media has been a factor in efforts to limit graft and corruption. Non-governmental organizations (NGOs) have taken on a watchdog role and exposed cases of corruption. The Philippine Center for Investigative Journalism (PCIJ) has been instrumental in exposing many cases that have resulted in the indictment of a number of officials. Despite these efforts, however, corruption continues to be a fact of life especially in Metro Manila. Lack of transparency and accountability is particularly widespread in the awarding of large contracts for urban infrastructure and services, procurement of supplies and materials, tax assessment, collection and audit, and appointment of individuals to lucrative posts such as the customs bureau or the internal revenue service (Laquian, 2002b).

3. Types of mega-urban region governance

There are essentially three approaches to governance of mega-urban regions in Asia: (a) autonomous local government systems; (b) mixed regional governance approaches; and (c) unified governance systems. These systems are based on the types of political structures used to perform specific functions, where formal authority is located and the relationships among local units as well as with the central government.

a. Autonomous local governance

In an autonomous local governance system, individual cities and municipalities in a city-region function independently of each other. Responsibility for urban infrastructure and services is lodged in each local government unit. A good example of autonomous local governance was Metro Manila before the creation of the Metro Manila Commission (MMC) in 1963 when four cities with their own city charters and four towns belonging to the Province of Rizal ran their own affairs. In those days, a road built in one local government jurisdiction ended at the border and was not continued by another. If a fire broke out in one city, the fire department of another did not come to help, especially if the mayors of both localities belonged to different political factions. This local fragmentation was supposed to have been solved by the creation of the MMC which had been replaced by the Metro Manila Development Authority (MMDA) in 1995, but fragmentation continues. The MMDA, however, continues to be a weak agency. It is formally in charge of comprehensive planning, land use control, urban renewal, traffic and transport management, solid waste disposal, flood control and drainage, engineering and public works, and public safety but it does not have the financial and human resources to carry out these function. It has prepared a metropolitan development plan but this has not been formally adopted and made into law. Thus, individual local government units pass their own zoning codes and regulations without any reference to the plan (Laquian, 2002a).

b. *Mixed regional governance*

In a mixed regional governance system, authority and power over city-region affairs are shared by local and central government bodies. For example, services such as public works and construction, education, public health and environmental protection are vested in central government ministries; some area-wide functions like water supply, electricity, solid waste disposal, and traffic control may be lodged in a metropolitan authority and purely local functions like garbage collection, police, and fire protection may be the responsibility of local government units.

The Special Capital City District of Jakarta or *Jakarta Raya* is a good example of a mixed regional governance system. There are at least four levels of governance in the capital district: (a) central government ministries; (b) Jakarta Raya itself which is a Level 1 unit (with the status of a province); (c) municipal level bodies called *kabupaten* or *kotamadya* such as Tangerang, Bekasi and Bogor; and (d) village level governments. In areas within Jakarta Raya that belong to the Province of West Java, however, there are smaller local government units such as (e) administrative zones called *wilayah kota*; (f) sub-districts or *kecamatan* within each administrative zone; (g) local units called *kelurahan* within each sub-district; and (h) neighbourhood and street level bodies called *rukun warga* and *rukun tetanga*. The sheer number of governmental bodies in Jakarta Raya has created coordination difficulty. For example, problems like environmental pollution, over-drawing of ground water for commercial, industrial and household use, and the uncontrolled activities of private housing developers, especially in the outlying areas, require closer cooperation and coordination among the local bodies (Dharmapatni and Firman, 1995).

c. *Unified regional governance*

To cope more effectively with problems created by local government fragmentation, unified regional governance has been proposed in a number of Asian mega-urban regions. However, there are no examples as yet of such a broad-based governance structure. At most, there are unified *metropolitan* governance systems such as the Bangkok Metropolitan Administration (BMA), the metropolitan governments of Beijing, Shanghai and Tianjin, and the national capital authorities of Delhi and Dhaka. In these metropolitan areas, an institution is vested with the authority and power to manage urban affairs. Central government agencies continue to carry out specific functions in the region but, in general, most operations needed for the smooth functioning of the area are vested in the metropolitan body.

One problem posed by unified regional governance is the sheer size of mega-urban regions and the complex variety of local units included within their territories. Fears have been expressed that the existence of a second governance tier between autonomous local units and the central government will hinder citizen participation and cause delays in decision-making. There are those who argue, however, that hi-tech innovations in electronic communication will enable citizens, assisted by civil society activist groups and mass media to participate more easily in public decision-making. This is certainly the vision in the planned developments of Cyberjaya and the new administrative capital of Putrajaya in Malaysia that are linked together by “smart” communication networks.

Some advocates of mega-urban region governance are hoping that the formulation of comprehensive city-region plans will eventually lead to the creation of unified mega-urban region governance. For example, in the Pearl River Delta, there is a call for closer integration of public decision making among the metropolitan governments of Guangzhou, Shenzhen, Hong Kong SAR of China, Zhuhai and Macao SAR of China. Planners who have cooperatively initiated the formulation of a mega-urban region plan envision a future where they will be able to achieve their development goals of “competing together rather than competing against each other” (Yeh, 1996).

D. INCLUSIVE DEVELOPMENT IN MEGA-URBAN REGIONS

As the forces of globalisation dominate developments in the 21st century, mega-urban regions have become key foci of economic growth, technological innovations and societal change. As John Friedmann observed, to understand the functioning of the world economy, it is more instructive to consider what is happening in 30 or 40 mega-urban regions or quasi-city states rather than events in 185 nation states. Mega-urban regions are “linked to each other in a global system of economic, social and political relations.” They are “vital command centres, switching points, and global investment hubs through which the national economy is articulated – a network of city regions that function as the new core areas of the world economy” (Friedmann, 1998).

The main challenge for development at present, as noted by the presidents of both the World Bank and the Asian Development Bank, is how to achieve “inclusive development” that encompasses all sectors of society. Advocates of mega-urban region development in Asia and elsewhere are hoping that inclusive development can be achieved by using planning and governance mechanisms for mega-urban regions. As they begin to understand the dynamics of economic and social processes in these mega-urban regions, they envision them as the generators not just of economic development, but, of genuine social and technological changes.

Careful analysis of mega-urban regions reveals that inclusive development can be achieved in these places in at least five ways: (a) by closely integrating rural and urban areas within mega-urban regions; (b) by including all levels of local governments in the city-region in planned development and governance schemes; (c) by including all sectors of society, especially the poor and underprivileged in city-region development; (d) by integrating all urban infrastructure and services in area-wide networks; and (e) by conceiving of city-region development as a policy instrument for achieving economic, social and environmental sustainability.

Past approaches in mega-urban region planning and governance have been negatively influenced by an approach that drew a sharp distinction between urban and rural areas. Inclusive development realizes, however, that both urban and rural sectors are essential parts of a mega-urban region. It also recognizes that food is a basic necessity and it should be produced as close to consumers as possible to cut down on transport, packaging, preservation and handling. Efficient urban waterworks systems require protection of watershed areas outside the political boundaries of the city. The disposal of solid and other types of urban waste demand sanitary land fills or incinerators located far from population centres. Forests, green areas, parks and open space act as the lungs of the city and have to be included in the mega-urban plan to achieve environmental sustainability.

City-region development requires that all types of governance structures including big cities, small and medium-sized cities, provincial and state units and agencies of the national government should be included in the whole development strategy. Decentralisation and adherence to local autonomy fragment governance structures and make cooperative and coordinated action difficult. Improved communication technologies in mega-urban regions enable citizens, with the assistance of civil society groups and the mass media, to receive information they need for active participation in public decision-making. Policies and strategies that achieve the welfare of the whole society rather than the particularistic interests of specific groups are needed for inclusive city-region development.

Planning and governance of mega-urban regions should include all sectors of society within the expanded territory. It should not create separate and well-serviced “gated communities” for the rich in some areas and ghettoized slums and squatter communities of the urban poor in others. It should treat as stakeholders men, women, youth, the elderly, ethnic groups, cultural groups and all other segments of society who should be free to participate in decision making.

Unified development requires an integrated approach to providing urban infrastructure and services in mega-urban regions. Planning a waterworks system, for example, requires careful consideration of energy generation (as in hydroelectric projects), food production (irrigation for agricultural crops), health and sanitation (faecal matter contaminates sources of water supply), solid-waste management (uncollected garbage dumped into rivers and streams clogs up waterways, hampers drainage and pollutes surface and ground water), and transport systems (air and water pollution from vehicle exhausts causes acid rain that degrades surface-water sources).

Finally, inclusive development calls for strategies for achieving economic, social and environmental sustainability. Economic sustainability requires the full valuation of natural resources, the maintenance of capital stock, promotion of growth with equity, poverty reduction and the internalisation of the impact of economic activities. Social sustainability requires consideration of “social capital” which enhances the capabilities of human beings (education, good health, skills training), means for achieving social stability, the empowerment of disadvantaged people and prevention of social disorganization. Environmental sustainability addresses ecosystem integrity, habitat conservation, the preservation of species and consideration of the carrying capacity of ecological systems. By including all these aspects of sustainability in the planning and governance of mega-urban regions, the role of these city-regions in overall development will be enhanced.

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URBAN SYSTEM PLANNING IN CHINA: THE CASE OF THE PEARL RIVER DELTA

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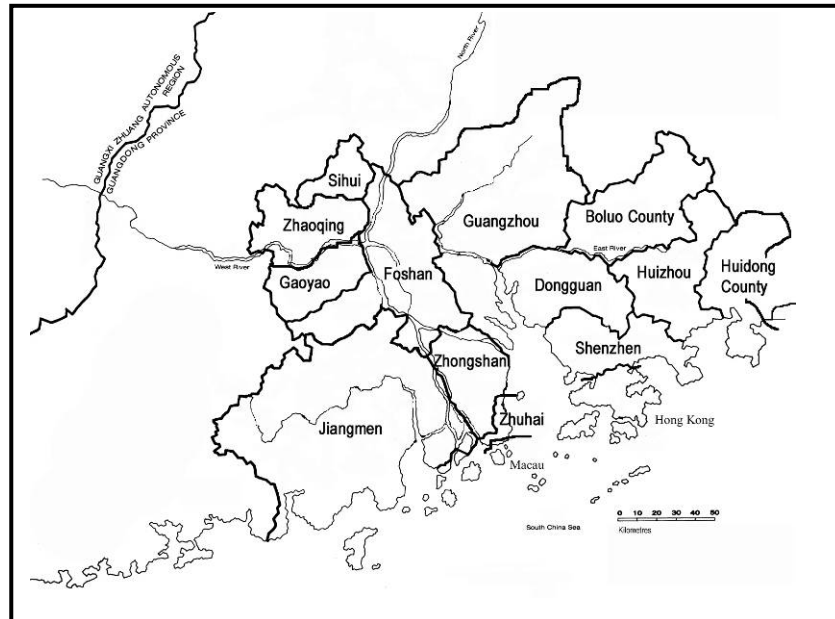
Since the late 1970s, and as a result of China's open policy to foreign investment, the Pearl River Delta (PRD) in the Guangdong Province in southern China has become a "world factory," a growth pole in the transitional economy. The population of the PRD has grown from 16.3 million in 1980 to 44.5 million in 2006. Rapid urbanization and industrialization have brought about impressive economic growth, on one hand, and geographically-uneven development, social polarization and environmental degradation on the other. Three urban system plans were formulated in 1991, 1995 and 2005, respectively, to give directions for development in the region. This paper starts with a description of the rapid process of growth of the PRD. A discussion of the successive urban system plans follows.

A. THE PRD REGION –GENESIS OF THE WORLD FACTORY

The PRD is located in the Guangdong Province, the southern gate of China (figure 1). Guangzhou (Canton) was a port of external trade well before the Opium War started, in 1839 (Yeung, 1994, p. 6). The Opium War (1839-42) forced the country to recognize and accept foreign commercial and industrial trade rights. However, when the People's Republic of China was set up in 1949, the centrally planned economic system closed the country to foreign investment for almost three decades. Vigorous economic reforms and policies to open the country to foreign investment were adopted in 1978. China moved rapidly from a centrally-planned economy to a market economy with different levels of the party-led governments struggling to separate political and economic functions in the course of introducing market mechanisms. Today, after two decades of open-market reforms, China plays an important role in international trade.

In order to understand this change, Hong Kong special administrative region (SAR) of China has to be brought into the picture. As a result of the Opium War, Hong Kong SAR of China became a British colony. While China adopted a closed-door policy, the economy of Hong Kong SAR of China flourished and became one of Asia's miracles. In many aspects, Hong Kong SAR of China was the model of development when China started to carry out economic reforms in the late 1970s. As a result of the transfer of sovereignty of Hong Kong SAR of China from the United Kingdom to the People's Republic of China in 1997, Hong Kong SAR of China became a player in the development of the PRD. Since the 1970s, Hong Kong SAR of China's economy has become a service economy. Rising production costs, escalating land and property prices and the attraction of speculative investment opportunities in the stock market left little space for the survival of the manufacturing industries. Hence, the opening up of socialist China provided "a breathing space" for the then weakening manufacturing industries of Hong Kong SAR of China. Today, about 90 per cent of Hong Kong SAR of China's manufacturers have production facilities in the PRD. Hong Kong SAR of China investors have employed about six million workers in some 65,000 factories in the Delta (Hong Kong SAR of China Trade Development Council, 2002). Over 80 per cent of Hong Kong SAR of China traders source from the PRD, and Hong Kong SAR of China handles about 80 per cent of the PRD's imports and exports (ibid, 2002). Hong Kong SAR of China is one of the two special administrative regions of the People's Republic of China, and is integrated in the PRD under the arrangement of the "One Country, Two Systems", a concept master-minded by the late Deng Xiaoping, China's patriarchal leader to ensure the continuation of Hong Kong SAR of China's capitalistic economy and political system under China's socialist regime.

Figure 1. The Pearl River Delta



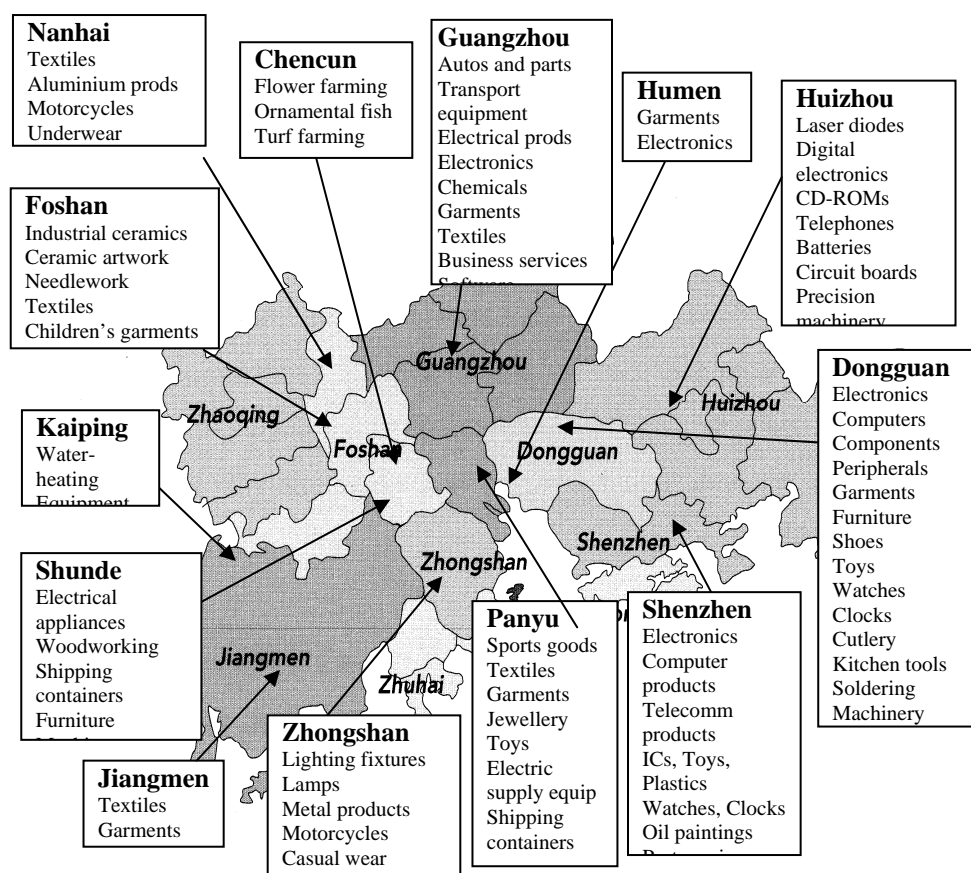
Source: Modified from <http://www.c-c-c.org/images/roots/PearlRiverDeltaGuangdongChina1600x1304.jpg>, accessed on 17 December 2007.

The PRD has rapidly evolved from a mainly rural region to an industrial one. Figure 2 shows the main clusters of industries in the PRD region. From 1978 to 2000, the region's economy grew at a rate of 16.9 per cent a year, compared with 13.8 per cent for the Guangdong Province and 9.6 per cent for Mainland China (Enright and Scott, 2002). Hong Kong SAR of China's productive investment in the PRD has changed Guangdong's economic structure. In 1978, 73.7 per cent of the total labour force in Guangdong was employed in the agricultural sector. But in 1997, the traditional agricultural sector employed only 41 per cent of the labour force, whilst the remaining 59 per cent were employed in the secondary and tertiary sectors (Ng, 2000, p.73).

Table 1 displays various indicators showing the rapid growth of the PRD. Its population grew from 16.27 million in 1980 to 44.47 million in 2006.¹ During the period from 1978 to 2006, Gross Domestic Product (GDP) in the PRD increased 180 times, total investment in fixed assets was up 150 times, export expanded 507 times and the amount of foreign capital actually utilised increased 41-fold. The amount of savings by urban and rural residents increased from 1.2 billion Renminbi (RMB) in 1978 to 1,818.7 billion RMB in 2006 (Guangdong Statistics Bureau, 2007).

Although the PRD occupies only one quarter of Guangdong's area and contains 48 per cent of its population (table 2), the Delta accounts for 81.8 per cent of the province's GDP and about 95.6 per cent of its exports (Guangdong Statistics Bureau, 2007). Because of its large population, the PRD is not only a centre of production but also a big consumption market. Table 2 illustrates the importance of the PRD in Guangdong's economy in terms of population size, GDP, international trade and foreign investment.

Figure 2. Localized industries in the Pearl River Delta



Source: Enright, M.J., Chang, K.M., Scott, E.E. and Zhu, W.H. (2003). *Hong Kong SAR of China and the Pearl River Delta: the Economic Interaction*. Sponsored and published by the 2022 Foundation, p.46.

TABLE 1 – KEY ECONOMIC INDICATORS OF THE PEARL RIVER DELTA (AT CURRENT PRICES)

Indicator	1980	1995	2001	2005	2006
Total end-year population (million)	16.27	21.38	42.88*	43.15	44.47
GDP (RMB billion)	11.92	389.97	840.07	1 805.94	2 142.43
Primary industry (RMB billion)	3.07	31.49	44.80	49.88	51.4
Secondary industry (RMB billion)	5.40	195.71	415.47	919.6	1 107.29
Tertiary industry (RMB billion)	3.45	162.77	379.80	836.45	983.74
Total fixed assets investment (RMB billion)	1.66	149.10	310.22	526.33	588.91
Total retail sales of consumer goods (RMB billion)	7.07	154.47	312.01	579.61	668.19
Total amount of export (USD billion)	0.62	46.11	52.02	227.32	288.75
Foreign capital actually used (USD billion)	0.10	8.58	14.19	11.33	13.09
Government revenue (RMB billion)	2.32	31.53	74.57	118.91	142.43
Government expenditure (RMB billion)	0.82	31.66	82.27	151.78	165.31
Savings deposits by urban & rural residents at year-end (RMB billion)	2.10	281.04	767.06	1 628.75	1 818.73

Sources: 1980 figures are from Enright, M.J., Chang, K.M., Scott, E.E. and Zhu, W.H. (2003). *Hong Kong SAR of China and the Pearl River Delta: the Economic Interaction*. Sponsored and published by the 2022 Foundation, p.25; 1995 and 2001 figures are from Guangdong Statistics Bureau, *Guangdong Statistical Yearbook 2002*, Beijing, China: China Statistics Press, p.541; and 2005 and 2006 figures are from Guangdong Statistics Bureau, *Guangdong Statistical Yearbook 2007*, Beijing, China: China Statistics Press, p.557.
* Figure obtained from the 2000 Fifth National Population Census of China which adopted a de jure method (usual residents) and used midnight, November 1, 2000 as the reference time.

TABLE 2. KEY STATISTICS OF THE PEARL RIVER DELTA, 2006

<i>Profile</i>	<i>Percentage of China</i>	<i>Percentage of Guangdong</i>
Area	0.43	23.19
Population	3.38	47.80
GDP	10.23	81.76
Exports	29.80	95.63
Imports	27.56	96.86
Foreign Direct Investment actually utilized	18.84	90.18

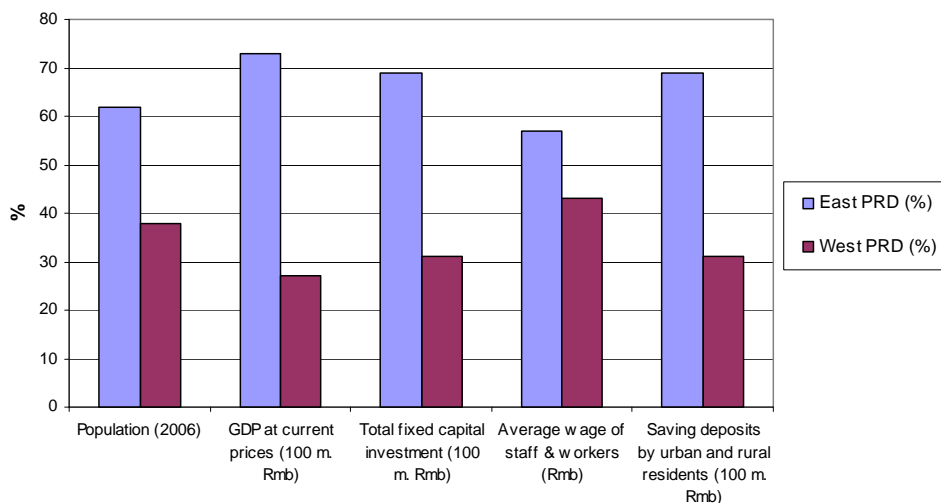
Source: Guangdong Statistics Bureau. *Guangdong Statistical Yearbook 2007*, p. 27 (for national and Guangdong figures), p. 557 (for PRD figures).

B. CHARACTERISTICS OF THE PRD REGION

1. Geographically uneven growth

Economic growth in the PRD region has been very vigorous but also geographically uneven. The Eastern part of the PRD has grown much faster than the Western part (figure 3), probably a result of its proximity to Hong Kong SAR of China. It was only in the late 1990s that cities in the Western part of the PRD started to actively attract foreign investment and pursue economic growth. Home to indigenous companies serving China's domestic markets, the potential for the Western PRD to play a larger role in international trade is high, especially with the accession of China to the World Trade Organization.

Figure 3. Disparities between eastern and western Pearl River Delta



Source: Derived from *Guangdong Statistical Yearbook 2007*, pp.102, 576-9, 605-6, 611-4.

2. "Uncoordinated" economic integration

Economic changes in the Delta have lead to different sorts of construction, at times disruptive to the local economic and social fabric (Ng, 2002, p. 287). Intense and aggressive competition for external investments has led to local protectionism, duplication of efforts and wasting of resources in the provision of infrastructure in the race to attract foreign investment (Ng, 2002, p.287). Rapid industrialization

processes have brought about outstanding economic progress but also serious social and environmental problems. Many of the joint ventures and outward processing industries have been developed at the expense of the natural environmental and ecological system, challenging the sustainability of regional development (Gar-on Yeh and Li, 1997; Fu and others, 2003).

3. Environmental degradation

The PRD was once the “land of fish and rice.” However, rapid industrialization has degraded the environment by taking up rich agricultural land for industrial uses, by the contamination of air, water, noise pollution and wastes produced in the industrialization and urbanization process (Ng, 2002, p. 286). Cultivated land in the PRD dropped by 56 per cent, from 966,667 hectare in 1978 to 542,114 hectare in 2005 (Wang and Sun, 1998, p. 22; Guangdong Statistics Bureau, 2007). The whole PRD lies within Guangdong’s “acid rain control zone.”² There are over 10 mega-power plants along the coast of Shenzhen and Zhuhai, emitting pollutants without proper treatment (Wang, 2000, p. 78). In other parts of the Delta, pollution in rural areas had led to death of poultry and in some places, water becomes undrinkable. All these have threatened agricultural modernization in the Delta (Wang, 2000, p. 78).

Water pollution is also a serious problem in the PRD. The problem is reflected in the costs of controlling water quality in the eastern part of Shenzhen, on which Hong Kong SAR of China relies for its water consumption. It has been reported that to maintain a grade III water quality, an investment of at least 4.6 billion RMB plus an annual operational cost of 0.5 billion RMB were required (Xu, 2002, p. 6.4-4). The costs would be much higher if a grade II quality were to be attained, due to rapid industrialization and urbanization in the water catchment areas. Waste water discharged increased at an annual rate of 11.1 per cent in the early 1990s (Wang and Sun, 1998, p.20), and in 2006, 42.7 per cent of the waste water generated by urban residential areas was treated (Guangdong Statistics Bureau, 2007). Most of the cities in Guangdong had no sewage treatment plants. In 2006, household sewage discharge of the province amounted to 5.3 billion tons (Guangdong Statistics Bureau, 2007). Pollution problems in the PRD cannot be contained within the Delta itself and urgent environmental problems need to be tackled by concerted efforts of various constituencies of the Hong Kong SAR of China-PRD region. However, the existing institutions that could help to articulate these efforts in the region are weak.

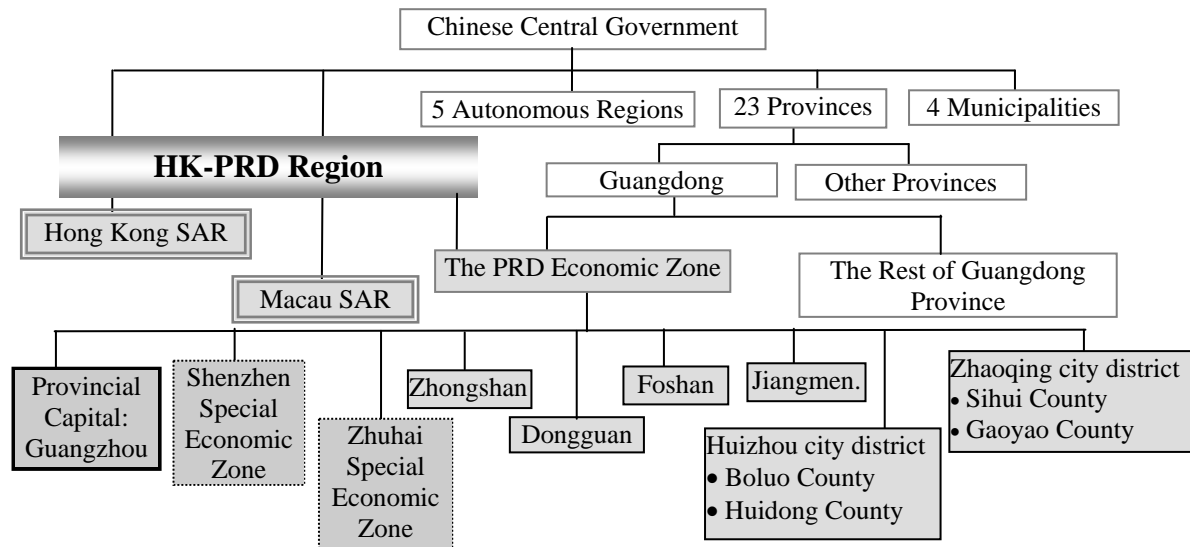
4. Fragmented administration

Although the PRD region constitutes one single ecological environment united by a river system that makes up the East, West and North Rivers (there is no Pearl River as such), it is managed under multiple administrative systems. Figure 4 highlights the complexities of the institutional set up. In the PRD region, there are two Special Administrative Regions, Hong Kong SAR of China and Macao SAR of China, which report directly to Beijing. Also within the PRD there is the provincial capital of Guangzhou, the two Special Economic Zones of Shenzhen and Zhuhai, eight cities (Huizhou city district, Dongguan, Zhongshan, Jiangmen, Foshan, Zhaoqing city district, Sihui and Gaoyao), and two counties, Huidong and Boluo.

Foreign investment tends to go towards small cities and counties in the Delta, probably because of the large presence of small- and medium-sized labour intensive manufacturing enterprises (Sit and Yang, 1997). Another important reason is probably the availability of cheap labour and land and the fact that environmental and planning control is weaker. In order to attract foreign investment, administrative units have engaged in intense competition to provide better and more infrastructure within their own jurisdiction. Government officials in these administrative units strongly protect local self-interests, affecting genuine economic and spatial integration at a larger geographical scale. The existence of these numerous administrative units in the PRD has led to serious problems in coordinating road and railway networks, flooding controls and general planning. For instance, within a radius of 58 km, there are five

airports of international standards. The ports of Chiwan, Shekou, Yantian, Ma Wan, Zhuhai and Dongjiaotou and Hong Kong SAR of China are all within a 35-nautical mile circle (Ng, 2000, p. 74).

Figure 4. “One environment, multiple systems” in the Hong Kong SAR of China-PRD region



Source: Guangdong Statistics Bureau, *Guangdong Statistical Yearbook 2007*, http://www.gdstats.gov.cn/tjnj/table/20/e20_3.htm, accessed on 1 December 2007.

C. URBAN SYSTEM PLANNING IN THE PRD

According to Article 7 of China's City Planning Law ³ enacted in 1990, “[t]he comprehensive plan for a city shall be coordinated with territorial planning, *regional planning*, water space planning and comprehensive planning for the use of land” (my emphasis). And urban system planning is an important component of regional planning. As early as 1988, the Construction Commission of Guangdong Province, aware of the problems of development in the PRD, commissioned a study on the PRD Urban System Plan. A plan was made in 1989 by the Geography Research Institute of the Guangdong Academy of Social Sciences, and the provincial government suggested that towns and cities refer to that plan for its implementation (Construction Commission of Guangdong Province and the Planning Group of the Pearl River Delta Economic Region Urban System Plan, 1996, p. 105). However, the plan did not have effective mechanisms to ensure a systematic implementation, and towns and cities undertook only some measures, mostly those beneficial for them (op cit., 1996, p. 105). With accelerated development problems in the PRD, at the end of 1994, the provincial government initiated the preparation of the “PRD Regional Plan”, which was completed in 1995. Five themes were investigated in the regional plan, and the urban system plan was one of them. ⁵ In 2005, fast development and economic growth in the PRD prompted the Ministry of Construction and the Provincial Government to formulate a new Urban System Plan. These two Urban System Plans represent novel planning practices that try to transform inter-city competition to foster regional competitiveness in China's transitional economy.

*1. Urban System Plan for the PRD: The planning for the urban agglomeration of the PRD economic region—coordination and sustainable development (1995)*⁴

a. Process, goals and principles

The 1995 Urban System Plan for the PRD was formulated by a team of 12 dedicated young planners after six months of intensive survey, research and deliberations. Planning expert groups, leaders and technical staff of various cities in the PRD contributed to the finalization of the plan, which underwent six rounds of revisions. The overall objective of the 1995 Urban System Plan for the PRD was to enhance economic growth and to ensure environmental sustainability through forward-looking, coordinated planning and development among local authorities (Ng and Tang, 1999, p. 602). Four planning principles and four specific goals were put forward:

Principles:

- Overall efficiency;
- Complementarities of comparative advantages;
- Sustainable development; and
- Care for the people.

Goals:

- To analyse the urbanization path of the PRD and to formulate a development strategy for the urban system;
- To control the development of land use and to coordinate planning and construction;
- To use standards and guidelines to regulate planning and construction so that urban development can be improved;
- To employ feasible administrative and legal measures to implement the plan;

b. Development goals and strategy

As in other regional plans, the Urban System Plan for the PRD developed a strategic vision, and identified three major strategic goals (CCGP, 1996, pp. 25-27):

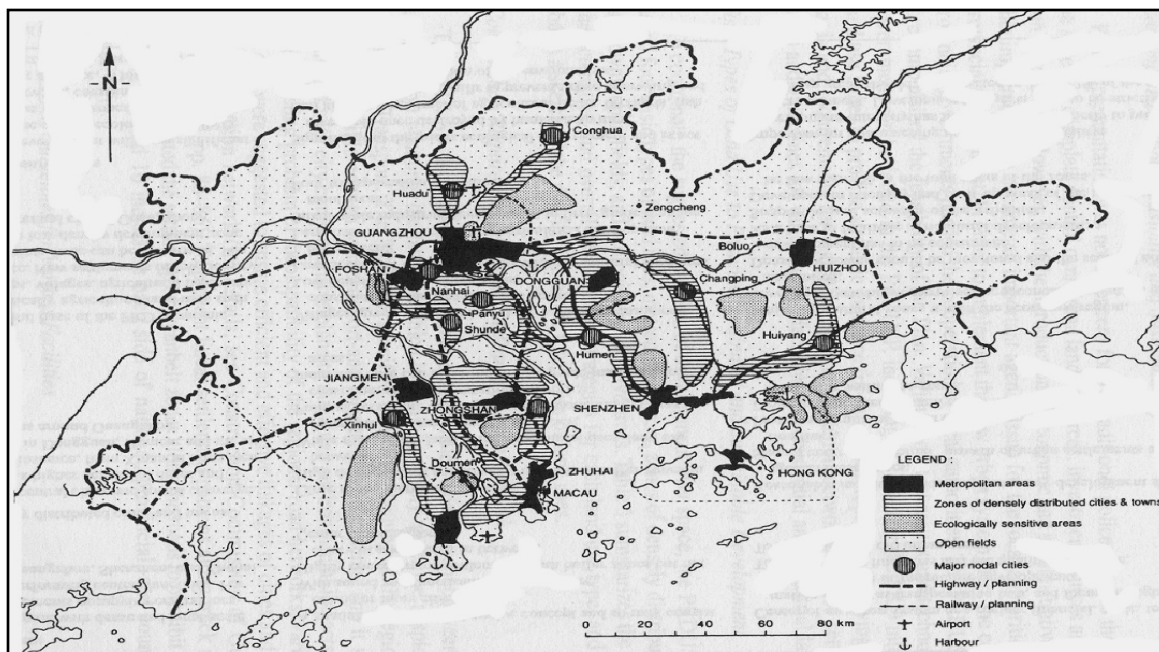
- To develop the PRD as a major mega-urban region in Pacific Asia and to be the dragon head for socio-economic development in Southern China;
- To develop a modern urban system with an improved rank size distribution of different types of cities, a clear division of labour with complementary functions, and a rational and balanced distribution of transportation and communication networks; and
- To enhance rural-urban integration.

The strategy was centred on spatial development and policy issues were not covered. The plan was in the tradition of those prepared under a centrally planned economy: population forecasts were used for designating the amount of urban and rural lands. It was forecasted that by the year 2010, total population of the PRD would be about 34 million, 5 million of which would be temporary residents. And among these 34 million, 75 per cent would be urban and 25 per cent would be rural dwellers. Based on these projected figures and certain assumptions on land required to sustain rural and temporary population, land requirements were calculated. Using the forecasts, a total of about 3,400 km² were planned for urban uses and about 1,000 km² were planned for rural settlements. This type of “allocative planning” turned obsolete rather quickly because the speed of change in the PRD has been unprecedented. According to the

2000 Census, there were over 42 million people in the PRD in 2000, including about 20 million of floating population.

Figure 5 captures the development strategy proposed in the Urban System Plan for the PRD. To boost the role of the PRD as the “dragon head” of southern China, the Plan suggests that the cities of Guangzhou (provincial capital), Shenzhen and Zhuhai (special economic zones) should play a dominant role in the hierarchies of cities in the central, eastern and western metropolitan subregions. Guangzhou would be a core city, supported by Shenzhen and Zhuhai as sub-cores. These cities were given the role of stimulating growth of other cities within their sub-region to achieve “group championship.”

Figure 5. Development strategy of the Urban System Plan for the PRD



Source: Ng, M.K. and Tang, W-S. (1999). “Urban system planning in China: a case study of the Pearl River Delta.” *Urban Geography*, vol.20, Issue 7, p.610, modified and synthesized from Construction Commission of Guangdong Province and the Planning Group of the Pearl River Delta Economic Region Urban System Plan (CCGP) (1996). *The Planning for Urban Agglomeration of the Pearl River Delta Economic Region: Coordination and Sustainable Development*. Beijing: China Construction Industry Press, pp.56, 63 (in Chinese).

The core and sub-core cities in the PRD will serve as radiation foci linked up by infrastructure such as highways, railways or information superhighway corridors. Through coordination of large-scale infrastructure development, rural and urban spaces within the region would be integrated economically and spatially. As a result, two development axes and seven growth axes were proposed to integrate the PRD. According to the Plan, the central metropolitan area should serve as a transportation hub, a comprehensive industrial base, a centre of trade, technological development and scientific research. Population should be kept under 10 million and population density under 1,000/km². The Eastern metropolitan area should serve as the export processing centre for industries in Hong Kong SAR of China and develop international finance, trade and high-tech industries. However, there is a need to control population growth and to conserve the Dongjiang water. Comparatively speaking, the Western metropolitan area has underdeveloped external links. Hence it would focus on utilizing its rich cultural and natural resources for the development of tourist industries.

c. *Implementation proposals*

To achieve this Plan, the PRD was divided into various land use zones and standards and guidelines were set for urban facilities and residential and industrial land uses. The Plan also attempts to enhance coordinated development between land use and transport planning. Cities and towns in the PRD were divided into three types, with differing standards for the provision of urban facilities:

- Type “A”: Guangzhou, Shenzhen and Zhuhai;
- Type “B”: Foshan, Jiangmen, Zhongshan, Zhaoqing, Dongguan and Huizhou; and
- Type “C”: local centre cities and satellite towns.

Various legal, management, fiscal, land supply, and transport policies and mechanisms had also been proposed to coordinate planning and implementation of the Urban System Plan.

d. *Comments*

The 1995 Urban System Plan represents the provincial government’s efforts in coordinating previously unfettered developments by various local authorities in an era of administrative decentralization and intense economic competition. However, for a variety of reasons, the Plan has not been effectively implemented nor enforced. As the Plan was set up within six months, local authorities and other groups, had limited time to contribute, respond or modify it. All this evidently also limited the Plan’s realism and ownership by the local entities that would be able to implement it.

In fact, little was said about sectoral policies or roles of the emerging “private” sector, implicitly suggesting that the local authorities then still had considerable control over developments within their territories. Instead of starting with a wider vision of China as a whole and explaining how developments in the PRD could help achieve the national vision, the Plan started with a discussion of population size and land use requirements. The legacy of a centrally-planned economy prevailed then and governments at every level, up to this date, are used to responding to social and economic targets set by the higher levels of government through various five year plans. The notions of sustainable and coordinated development were discussed but no strategy was put forward to realize this principle.

The Plan lacked a strategic vision at the macro level—for instance, it did not discuss what roles China should play in the international and regional contexts, and how these would affect the region. In addition, Hong Kong SAR of China was not included the Plan. However, at that time, Hong Kong SAR of China’s GDP was six times that of the whole PRD. Putting Hong Kong SAR of China in the picture then would have dramatically changed the Plan’s strategy. Finally, the Plan devised no mechanisms to ensure implementation.

2. *PRD Urban System Coordinated Development Plan 2004-2020 (Plan 2005)*

The new regional plan aims at boosting the competitiveness of the PRD and is made according to the nation’s City Planning Act, Methods of Plan Making, The Tenth Five-Year Plan of the Guangdong Province, Urbanization Framework of the Guangdong Province and Opinions on Promoting Urbanization, etc. and an understanding of real developments in the PRD (Guangdong Government, 2005, Article 1). The guiding principles, development goals and implementation measures of the Plan 2005 are more elaborate and operational than in previous plans, but it is still not formulated by consensus, meaning that local authorities may lack the enthusiasm to implement the Plan.

a. *Process, goals and principles*⁵

The PRD region has begun to realize that, after all, coordination may be necessary in the face of keen competition from mega urban regions within and outside China. In July 2003, under the guidance of the Guangdong Provincial Government and the Ministry of Construction, the Construction Bureau of the Guangdong Province, a planning team comprising the China Academy of Urban Planning and Design, the Shenzhen Municipal Academy of Urban Planning and Design and the Guangdong Province Development Research Institute, was formed. The team started with a thorough survey of the region through over 30 interviews, forums, expert dialogue and consultations, an advancement over the previous Urban System Plan for the PRD. In January 2004, the Plan was thoroughly discussed in a conference on urbanization in Guangdong. The Plan was then revised and improved by May 2004. An expert meeting was called in July 2004 to deliberate and assess the Plan, which was further revised for approval by the Provincial Government in December 2004. The Plan 2005 was even posted on the internet from September to November 2004 for public comments before it was sent for approval by the Guangdong Provincial Government and Guangdong People's Congress. The Plan was eventually enacted in April 2005.

While the 1995 Plan was a path-breaking effort by planners in China to formulate a plan based on an understanding of developments on the ground, the 2005 Plan has further developed this new planning approach. After all, over 20 years of rapid growth has brought many problems to the PRD. Without a thorough understanding and assessment of these, no meaningful regional plan can be formulated. Unlike the previous plan, the 2005 Plan also makes emphasis on understanding the relationships between the PRD, the wider pan-PRD region,⁶ national development strategies and international developments. The 2005 Plan has a total of 106 articles in 10 chapters: overview; development goals and scale; spatial development strategy; overall spatial development planning; spatial support systems planning; sectoral policies and spatial governance; coordinated spatial planning of cities; important action plans; guarantee measures and supplementary clauses.

Regional polarization has worsened as the PRD develops; this is reflected in an imbalanced development between the Eastern and the Western sides of the Delta, the inner and outer rings of the Delta and rural-urban disparities. Such rapid development has posed serious sustainability issues for the region and serious contradictions can be seen: economic growth vs. shortage of resources; rising social demand vs. delayed public infrastructure; rapid growth of cities vs. worsening environmental stress. The overall goal of the 2005 Plan is therefore "to capture the opportunity to spearhead and accelerate coordinated development to boost regional competitiveness and to build a dynamic urban system" (Article 1, Guangdong Government, 2005). Sustainable development is the overarching principle in guiding the formulation of the Plan 2005: "to base in Guangdong with an eye of the nation and to face the world; to develop a path of economically sustainable development, with all round social progress, sustainable utilization of resources, environmental improvement and benign ecological cycles that will build the PRD into a champion of socialist modernization" (Guangdong Government, 2005, p. 3).

b. *The Development Strategy*

The strategy is premised upon maintaining a population of 65 million by the year 2020 though infrastructure planning will be based on a population figure of 80 million (Article 11). The annual rate of increase of land use requirement will be cut from five per cent to three per cent and per capita land use will be cut from 160m² to 140m². By year 2020, total land requirement will be capped at 93 million km², 22.3 per cent of the total land area. New development areas will amount to 26.6 km² (Article 12). At the same time, 83 million km² will be conserved, which is about 20 per cent of the total land area (Article 13).

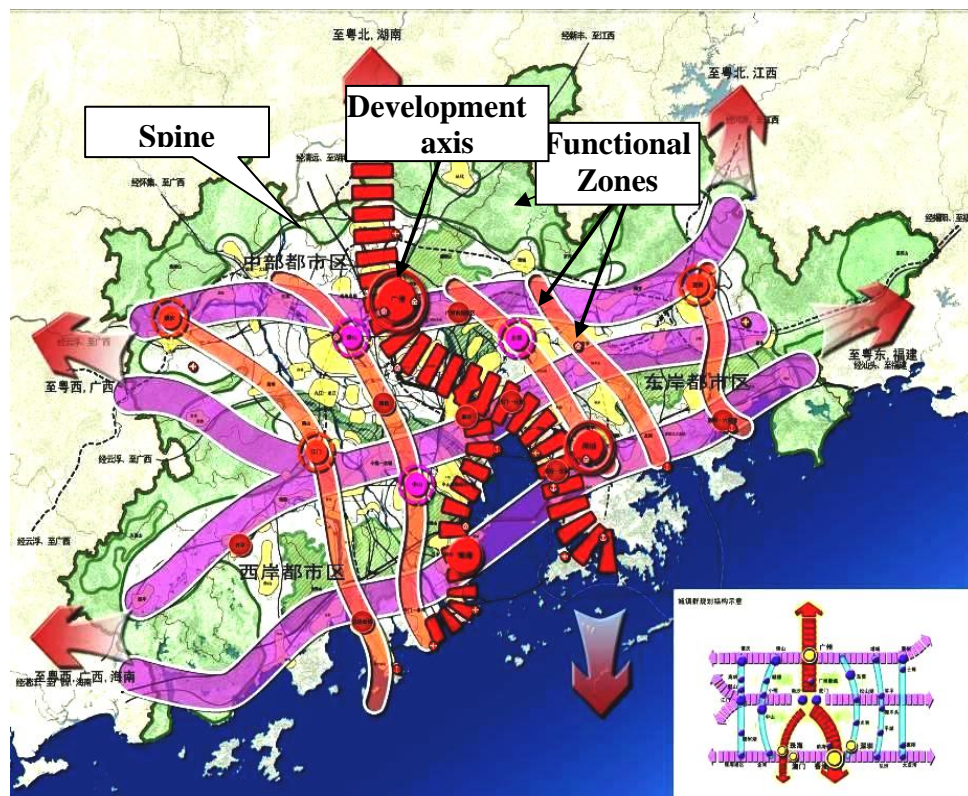
Five spatial development strategies are outlined: (1) strengthening the core, building the spines and boosting competitiveness in the regional core; (2) opening up the inner provinces, nurturing coastal

regions to increase development spaces; (3) upgrading the West side of the Delta, enhancing the East side to reduce disparities the PRD; (4) supporting the outer ring, integrating the inner ring to propel even development in the region; and (5) conserving nature, improving environmental conditions to realize sustainable development (Articles 15 to 19).

Figure 6 summarizes the idea of “one spine, three zones and five development axes” system. “The ‘spine’ is centred in the Provincial capital Guangzhou: to the South it goes to Shenzhen and Zhuihai and even to Hong Kong SAR of China and Macau SAR of China; to the north it goes along the Guangzhou Peking Railway to link up with other provinces. Through high-level infrastructure development and efficiency cooperation among various governments, the ‘spine’ will line up important cities and towns, together with high-tech industries, high-end services and transport hubs to complement developments in Hong Kong SAR of China and Macau SAR of China to enhance the competitiveness of the greater PRD” (Article 22). The three East-West running “functional zones” help link the PRD with other provinces to share resources and promote economic cooperation (Article 24). The five north-south running “development axes” are city-town-production axes which aim to nurture different types and scales of production activities (Article 26).

According to Article 29, there will only be one major urban core (from Guangzhou to Shenzhen) and one sub-core (Zhuhai), together with local cities. The urban core stretches along the spine while the sub-core in Zhuhai will strengthen links with Hong Kong SAR of China and Macau SAR of China in order to trigger developments in the western part of China. Local cities are not only the social, economic and cultural centre but they should also lead county-level rural and urban developments.

Figure 6. Spatial Development Plan: “One spine, three zones and five development axes”



Source: Modified from Guangdong Government (2004). *Pearl River Delta Urban System Coordinated Development Plan*. Ministry of Construction, Guangdong Government (in Chinese).

Three industrial production clusters are identified in the three metropolitan areas (Chapter 4): the central metropolitan area surrounding Guangzhou, Foshan and Zhaoqing focuses on production services and tertiary industries to boost the competitiveness of the PRD; the eastern metropolitan cluster of Shenzhen, Dongguan and Huizhou focuses on value added manufacturing industries, coastal industrial development and high-tech industrial growth; and the western metropolitan areas of Zhuhai, Zhongshan and Jiangmen is expected to grow considerably in manufacturing, tourism and logistics after the construction of the Hong Kong SAR of China-Zhuhai-Macau SAR of China Bridge.

The Plan 2005 also emphasizes on a sustainable regional ecological support system. A regional green plan based on “one ring, one zone, three nuclei and networked corridor” is put forward (Article 42). The “ring” runs from the western side of the PRD to the mountainous areas in the north and eastern parts. The “zone” runs along the coastal areas of the PRD. There are three major ecological nuclei in the central, eastern and western parts of the PRD. They play a very important role in ameliorating the impacts of the dense urban system in the PRD. The networked ecological corridors link the rivers, water body, agricultural fields and green spaces together contributing to the stabilization and health of the ecosystem in the region. While all these green spaces will be carefully conserved and managed, agricultural land will also be strictly protected. Water resources and air quality will be monitored with an aim to improving them. In order to better manage natural resources, recycling industries will be encouraged and local authorities will be charged for resources utilization. Environmental impact assessment will be strengthened and used to assess development projects and to avoid problems of cross-boundary pollution problems (Article 47).

Regarding social aspects, the 2005 Plan discusses the importance of “protecting and discovering historical heritage and cultural resources; building community places with local character; nurturing the Guangdong spirit (dare to try; pragmatically progressive; open-minded, dutiful and willing to sacrifice); building the PRD into a safe, comfortable, highly civilised, harmonious development zone that is full of character and charm” (Article 48). In section three of Chapter 5, the Plan contains a very comprehensive transportation network plan which consists of a highway network of “two rings, six horizontal links and 13 vertical links”; a railway network of “three horizontal links and seven vertical links”; an intercity railway network of “four horizontal and four vertical links,” “three horizontal and three vertical” aviation routes, together with five major airports and four deep seaports which contribute to a well-connected and multi-modal sea, land and water transportation network. The final section of Chapter 5 discusses the pressing importance in tackling environmental pollution issues and the need to undertake various environmental and anti-flooding engineering projects to ensure the safe operation of the region (Articles 61-64).

c. Spatial Governance

Instead of having only four land use zones as stipulated in the first Urban System Plan for the PRD, the Plan (Chapter 6) has a total of nine land use zones which are governed through four modes of governance. Table 3 lists the mode of governance that should be adopted for different types of land uses. For important regional resources such as green spaces and major transportation network, a stronger mode of governance is adopted. However, for developments that require cooperation, partnership or guidance modes of governance are encouraged.

TABLE 3. TYPE OF GOVERNANCE FOR DIFFERENT TYPES OF LAND USES

Top-level Governance (Monitoring governance)	Regional green space Regional transport corridor Regional basic & capital-intensive manufacturing industries cluster	Provincial government or headquarter departments via administrative or legal means to specify “green” and “red” lines, which will be strictly observed by the city governments. Provincial Government specify development type, scale of construction, environmental requirements and construction standards. City governments to build and construct.
Second-level Governance (Controlling governance)	Regional transportation hub Intercity planning and construction coordination areas	Related cities work together to produce joint development plans to ensure coordinated provision of services and functions. Plans damaging neighbouring cities will be asked by the Provincial government to be changed.
Third-level Governance (Coordinative governance)	Guangdong-Hong Kong-Macau SARs of China joint development areas	According to legal requirements, cities will formulate lower-level plans. All cities have to observe diligently the planning policies, regulations, standards and guidelines in producing their plans.
Fourth-level Governance (Guidance governance)	Economic growth support region City & town development areas General policy areas	

Source: Guangdong Government (2005). *Pearl River Delta Urban System Coordinated Development Plan*. Ministry of Construction, Guangdong Government, Article 70, pp. 33-34 (in Chinese).

d. Implementation

Chapter 7 (Article 71-80) of the Plan outlines what individual cities have to do to coordinate planning and development whereas Chapter 8 (Articles 81-97) lists the major action plans: external connections, bay area (from Zhuhai to Shenzhen) development; control of the green zones; heavy industrial bases; integration of transport; fostering sunshine coasts; new towns development and building a regional information platform. In Chapter 9, the Plan specifies measures to ensure the viability of the plan (Guangdong Government, 2005, Articles 98-102): an Office on PRD Urban System Planning and Management was established under the Provincial Ministry of Construction to review the Plan; evaluate regional planning; manage regional and local developments; facilitate public participation and undertaking research work; enacting the “PRD Urban System Planning Regulations”; putting in place various policy, planning, economic and technological measures to improve implementation; instituting both “sticks and carrot” measures to encourage partnership and achieve win-win situations; as well as introducing new monitoring mechanisms.

e. Comments

The Plan represents an improvement when compared to the 1995 Plan: different stakeholders were engaged in threshing out development issues in the region; it takes into account issues such as globalization, sustainable development, regional cooperation, heritage conservation, social justice and harmony; the planning process was still largely dominated by elites but it took into account public inputs; and various legal, administrative and economic mechanisms are put forward to ensure the endorsement and implementation of the Plan.

However, the development strategy outlined is still primarily focused on spatial development, prescribing patterns of development over space and highlighting the role of the Governments in ensuring the realization of the Plan. In the age of globalization and with the unprecedented surfacing of various social and environmental problems, the regional development strategy could have been more strategic and directive in nature: local support via collective envisioning by the Governments, the private sector and

local communities; auditing and harmonization, if necessary, of various policy areas to ensure the alignment of sectoral policies to achieve the agreed visions; and eventually the translation of these policies into spatial as well as non-spatial components to ensure smooth and effective implementation of land use plans by different stakeholders, particularly those involved in private sectors. In other words, spatial development plans should be the last step in strategic regional planning. Yet the Plan 2005 remains distinctively public-sector oriented and spatially focused. Collective visions and strategic implementation by different stakeholders through various administrative and market mechanisms are less emphasized. By and large, the 2005 Plan is 'plan-led' rather than 'policy-led'.

E. CONCLUDING REMARKS

Sustainable development requires that economic growth and capital be supported by rich and strong social and environmental capital. Unless the Hong Kong SAR of China-PRD region is treated as a region that can enrich and nourish people's lives, rather than just as a resource base exploited for economic growth, the region cannot be sustained. Moving away from a centrally-planned economy, various local entities in the PRD have tried to capitalize on the new economic and policy environment by pursuing economic growth at any cost. It is the right time for the region to rethink its future development strategy. The 2005 Plan moves in the right direction, as sustainable development is identified as the guiding planning principle. The establishment of the new Management Office is a very important step, though its effectiveness will only be seen as time goes by. If experience elsewhere serves as any indicator, a proper regional governance structure is essential and a management office with limited resources may not be adequate to monitor and review a development plan for a region with over 44 million inhabitants.

Although the 2005 Plan is better than previous plans, it is still imposed from the center and not owned by local jurisdictions. Its implementation is contingent on administrative monitoring by the Provincial Government. As there are few funding incentives for local authorities to work together, they will probably not collaborate. In addition, the 2005 Plan only focuses on the government sector. So far, the private sector and civil society have much little role to play in official plans.

With the internationalization of China's economy, a number of economic forces outside the region are bound to play increasingly important roles in the region's future development. Currently, the 2005 Plan relies on the Management Office and local authorities to review and modify it. However, mechanisms should be established to review the implementation and consequent modification of the Plan by other stakeholders. The Hong Kong SAR of China-PRD region badly needs a more inclusive and transparent regional governance mechanism to envision its future development.⁷

The PRD is one of the three major life-supporting river deltas along the east coast of China. It is home to millions of people whose ecological footprints probably extend to many other parts of the world. It is important for the local authorities to realize the importance of long-term sustainability. Unless sustainable regional development is pursued to rationalize infrastructure development, coordinate development strategies and tackle social and environmental problems, the existing culture of aggressive competition, if continued in the coming wave of economic expansion, will certainly create more harm than good. Long-term prosperity of the Hong Kong SAR of China-PRD region will depend on how the stakeholders in the Delta incorporate the principles of sustainable development and hence engage collectively in nourishing the region not just as an economic space by also as their life space.

NOTES

- ¹ According to the 2000 National Population Census of China, the total population of the PRD reached 42.89 million in 2000. The Fifth National Population Census adopted a de jure method (usual residents) and used midnight, November 1, 2000 as the reference time. The 2006 figure is listed in Guangdong Statistical Yearbook. Available from http://www.gdstats.gov.cn/tjnj/table/04/e4_1.htm, accessed on 1 December 2007.
- ² The acid rain control zones are those areas with precipitation pH lower than 4.5 and sulfur deposition higher than their critical loads (Hao, He, Duan, Li and Wang, 2007, p. 132).
- ³ City Planning Law of the People's Republic of China, http://www.clapv.org/new/show_en.php?id=32&catename=L, accessed on 19 December 2007.
- ⁴ Unless specified otherwise, the contents are extracted or synthesized from CCGP, 1996 and Ng and Tang, 1999.
- ⁵ Unless specified otherwise, the following is extracted from Guangdong Government, 2004.
- ⁶ The “Pan PRD Region” is made up of nine provinces and two districts: Guangdong, Fujian, Jiangxi, Guangxi, Hainan, Sichuan, Guizhou, Yunnan; and the Hong Kong and Macau Special Administrative Regions.
- ⁷ The government of Hong Kong SAR of China is currently undertaking a greater PRD study which examines the roles Hong Kong SAR of China should play in the region.

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CLIMATE CHANGE AND URBANIZATION: EFFECTS AND IMPLICATIONS FOR URBAN GOVERNANCE ¹

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A. INTRODUCTION

Urban governments have critical roles in adaptation to climate change as well as in mitigation (reducing greenhouse gas emissions). It can be argued that they have the central role in adaptation within their jurisdictions—although it is obvious that they need a supportive institutional, regulatory and financial framework from higher levels of government and, for most low- and middle-income countries, also from international agencies. This paper will focus on the effects of climate change on urban areas in low- and middle-income countries and the implications for urban governance. It will emphasize how most adaptation to the likely climate change-related dangers over the next few decades fit well within a local development agenda.

However, unlike most environmental hazards, local governments in low- and middle-income countries have no capacity to reduce the climate change-generated hazards that those within their jurisdiction will face. Local governments can reduce many environmental hazards, for example, they can treat water before it is distributed, reduce breeding possibilities for disease vectors, reduce physical risks through better quality buildings and infrastructure, traffic management and reduce exposure to dangerous chemicals through pollution control and occupational health and safety measures. But hazard reduction from climate change in low- and middle income countries depends on major changes in life-styles and consumption patterns among middle and upper income groups, most of whom live in high-income countries. There is a pressing need to address adaptation in urban areas in low- and middle-income countries as they have most of the world's urban population, most of the high-risk urban sites and the largest deficiencies in adaptive capacity. Urban areas in these countries are also projected to house almost all of the world's population increases in the next two decades (United Nations, 2008).

Low- and middle-income countries now have almost 72 per cent of the world's urban population (United Nations, 2008). They also have most of the urban population who face the greatest risk from the increased intensity and/or frequency of storms, flooding, landslides and heat waves that climate change is bringing or will bring. The high concentration of global deaths from extreme weather-related disasters in these countries is well known. If more precise data were available, it would likely show that a large and growing proportion of these deaths occur in urban areas of these countries (UN-Habitat, 2007). Most of the countries that are likely to face serious constraints on climate change-related fresh water availability are also low- and middle-income countries. In regard to sea level rise, China and India alone have more than a quarter of the world's urban population and the world's largest urban populations within low-elevation coastal zones. Africa, long considered a predominantly rural continent, has a larger urban population than Northern America—and close to two fifths of its population in urban areas (United Nations, 2008). It also has a high concentration of its largest cities in coastal areas. Without adaptation, climate change is likely to bring ever-increasing numbers of accidental deaths and serious injuries and increasingly serious damages to people's livelihoods, property, environmental quality and future prosperity.

The adaptive capacity of urban governments obviously has national importance too, given urban centres' economic and political importance—including their role as markets and service centres for

agriculture and rural development. Even predominantly rural countries generally have more than half their gross domestic product (GDP) derived from industry and service enterprises, most of which are in urban areas.

The need for action by city/municipal governments on climate-change adaptation is also urgent—and probably more urgent than suggested by the Fourth Assessment of the Inter-Governmental Panel on Climate Change (IPCC). This is because of new analyses of the vulnerability of urban populations to the increased risks or new risks that climate change is likely to bring in most low- and middle-income countries that were not available to IPCC Working Group II. These have begun to make clear the scale of this vulnerability—for instance in the analysis of the number and proportion of urban populations within the low-elevation coastal zone (McGranahan and others, 2007) and in a range of detailed local, city and regional studies (de Sherbinin and others, 2007; Dossou and Glehouenou-Dossou, 2007; Alam and Golam Rabbani, 2007; Revi, 2008; Awuor and others, 2008; Levina and others, 2007; Roberts, 2008).

B. THE IMPACT OF CLIMATE CHANGE ON URBAN AREAS

1. Introduction

Table 1, drawn from the IPCC's Fourth Assessment, lists the different aspects of climate change, the evidence for current impact, projected future impacts and the zones or groups most affected. It highlights the different kinds of impacts that arise from changes in extremes and changes in means; it also notes the need to consider the impacts of abrupt climate change, while also noting that its significance is less clearly established.

Among urban centres in low- and middle-income countries, perhaps the most obvious increased risk comes from the likely increase in the number and intensity of extreme weather events such as heavy rainstorms, cyclones or hurricanes. Of course, there are large differentials in the scale of such risks between urban centres in each nation. The urban centres most at risk are generally those where these events are already common and cause serious damage and disruption—although there is some evidence of the geographic range of some extreme weather events expanding. Coastal cities that are at risk from storms will be doubly at risk as sea-level rise increases hazards from coastal flooding and erosion.

For any city, the scale of the risk from these extreme weather events is much influenced by the quality of housing and infrastructure in that city, the extent to which urban planning and land-use management have successfully ensured risk reduction within urban construction and expansion, and the level of preparedness among the city's population and key emergency services. For small and large coastal settlements, the integrity of coastal ecosystems and in particular protective mangrove and salt marsh systems will also influence risk.

City dwellers in high-income countries have had risks in relation to injuries and deaths much reduced by decades of investment in housing and infrastructure—and economic/financial losses much reduced by insurance. But the devastation of New Orleans by Hurricane Katrina in 2005 is an example of how there are still exceptions—both in the lack of investment in flood defences coupled with degradation of the coastal environment, and in the inadequate institutional capacity of emergency services. This is also an example of deliberate local political choices to favour new development over risk reduction. New Orleans planned the expansion into the Lower 9th Ward (the lower part of the city that was devastated by Katrina); in 1999 the New Orleans Planning Commission stated that development in this area represented a significant employment potential for the city (Burby, 2006).

Hurricane Katrina also illustrated the higher vulnerabilities of many lower-income groups and this is an issue that is even more pressing in most urban centres in low- and middle-income countries. In

addition, cities are also vulnerable to any damage to the larger systems on which they depend—for instance for water supply and treatment, transport and electricity and thus everything that depends on electricity, including lighting, pumping and communications (Wilbanks and others, 2007).

TABLE 1. SELECTED EXAMPLES OF CURRENT AND PROJECTED IMPACT OF CLIMATE CHANGE ON INDUSTRY, SETTLEMENT AND SOCIETY AND THEIR INTERACTION WITH OTHER PROCESSES

<i>Climate-driven Phenomena</i>	<i>Evidence for current impact/ vulnerability</i>	<i>Other processes/ stresses</i>	<i>Projected future impact/ vulnerability</i>	<i>Zones, groups affected</i>
a) Changes in extremes				
Tropical cyclones, storm surge	Flood and wind casualties and damages; economic losses; transport, tourism, infrastructure (e.g. energy, transport), insurance	Land use/ population density in flood-prone areas; flood defences; institutional capacities	Increased vulnerability in storm-prone coastal areas; possible effects on settlements, health, tourism, economic and transportation systems, buildings and infrastructures	Coastal areas' settlements, and activities; regions and populations with limited capacities and resources; fixed infrastructures; insurance sector
Extreme rainfall, Riverine floods	Erosion/landslides; land flooding; settlements; transportation systems; infrastructure	Similar to coastal storms plus drainage Infrastructure	Similar to coastal storms plus drainage infrastructure	Similar to coastal storms
Heat- or cold-waves	Effects on human health; social stability; requirements for energy, water and other services (e.g. water or food storage), infrastructures (e.g. energy transport)	Building design and internal temperature control; social contexts; institutional capacities	Increased vulnerabilities in some regions and populations; health effects; changes in energy requirements	Mid-latitude areas; elderly, very young, and/or very poor populations
Drought	Water availability, livelihoods, energy generation, migration, transportation in water bodies	Water systems; competing water uses; energy demand; water- demand constraints	Water-resource challenges in affected areas; shifts in locations of population & economic activities; additional investments in water supply	Semi-arid and arid regions; poor areas and populations; areas with human-induced water scarcity
b) Changes in means				
Temperature	Energy demands and costs; urban air quality; thawing of permafrost soils; tourism and recreation; retail consumption; livelihoods; loss of melt water	Demographic and economic changes; land-use changes; technological innovations; air pollution; institutional capacities	Shifts in energy demand; worsening of air quality; impacts on settlements and livelihoods depending on melt water; threats to Settlements / infrastructure from thawing permafrost soils in some regions	Diverse, but greater vulnerabilities in places and populations with more limited capacities and resources for adaptation
Precipitation	Agricultural livelihoods, saline intrusion, tourism; water infrastructures, tourism, energy supplies	Competition from other regions/ sectors; water-resource allocation	Depending on the region, vulnerabilities in some areas to effects of precipitation increases (e.g. flooding, but could be positive) and in some areas to decreases (see drought above)	Poor regions and Populations
Saline intrusion	Effects on water infrastructures	Trends in groundwater withdrawal	Increased vulnerabilities in coastal areas	Low-lying coastal areas, especially those with limited capacities and Resources
Sea-level rise	Coastal land uses: flood risk, water logging; water infrastructures	Trends in coastal development, settlement and land uses	Long-term increases in vulnerabilities of low-lying coastal Areas	Same as above
c) Abrupt climate change				
	Analyses of potentials	Demographic ,economic, and technological changes; institutional developments	Possible significant effects on most places and populations in the world, at least for a limited time	Most zones and groups

Source: Wilbanks, Tom and Patricia Romero Lankao with Manzhou Bao, Frans Berkhout, Sandy Cairncross, Jean-Paul Ceron, Manmohan Kapshe, Robert Muir-Wood and Ricardo Zapata-Marti (2007), "Chapter 7: Industry, Settlement and Society," in Parry, Martin, Osvaldo Canziani, Jean Palutikof, Paul van der Linden and Clair Hanson (editors) *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge and New York, pp. 357-390.

NOTE: Text in italics and bold indicates very significant in some areas and/or sectors; text in bold indicates significant; normal text indicates that significance is less clearly established.

2. Flooding

Urban areas always present some risk of flooding when rainfall occurs. Buildings, roads, infrastructure and other paved areas prevent rainfall from infiltrating into the soil and hence produce more runoff. Heavy and/or prolonged rainfall produces very large volumes of surface water in any city, which can easily overwhelm drainage systems. In well-governed cities, this is rarely a problem because good provision for storm and surface drainage is easily built into the urban fabric, with complementary measures to protect against flooding, for example, the use of parks and other areas of open space to accommodate floodwaters safely from unusually serious storms. In most cities, there is also scope for land-use management and incremental adjustments to increase flood-water management capacity. But in poorly-governed cities, this does not happen. Most residential areas have no drainage system installed and rely on natural drainage channels—it is common for buildings or infrastructures to be constructed that actually obstruct these drainage channels. In Dhaka, buildings often encroach on or fill in drains and many natural drains have been filled up to construct roads (Alam and Golam Rabbani, 2007). Mombasa faces comparable problems (Awuor and others, 2008). In most urban centres in Africa, Asia and Latin America, a significant proportion of the population is not served by solid waste collection services. In cities or neighbourhoods with inadequate solid waste management or drain maintenance, garbage and plant growth can quickly clog drains, leading to localized flooding during or after even light rainfall. There is also a growing documentation on the inadequacies in drainage and flood protection for urban centres in Africa and Asia and of the trend towards increased numbers of deaths and injuries from flooding in urban areas. There are also many case studies highlighting the vulnerability of certain cities to floods and/or sea level rise including Alexandria (El-Raey, 1997), Cotonou (Dossou and Glehouenou-Dossou, 2007), Dhaka (Alam and Golam Rabbani, 2007), Banjul (Jallow and others, 1999) and Port Harcourt (Abam and others, 2000). A recent study documents the lack of provision in six African cities for reducing flood risks or for managing floods when they happen (Douglas and others, 2008). Floods are already having very large impacts on cities and smaller urban centres in many African countries—for instance the floods in Mozambique in 2000 which included heavy floods in Maputo, the floods in Algiers in 2001 (with around 900 people killed, and 45,000 affected); heavy rains in East Africa in 2002 that brought floods and mudslides forcing tens of thousands to leave their homes in Rwanda, Kenya, Burundi, Tanzania and Uganda, and the very serious floods in Port Harcourt and in Addis Ababa in 2006 (UN-Habitat, 2007; Douglas and others, 2008). Discussions with residents in informal settlements in various cities found that flooding is more frequent and intense and often occur in locations previously not at risk. They also showed how little local government was doing to address these issues (Douglas and others, 2008).

Climate change has the potential to increase flooding risks in cities in three ways: from the sea (higher sea levels and storm surges); from rainfall (by heavier rainfall or rainfall that is more prolonged than in the past); and from changes that increase river flows (through increased glacial melt). The IPCC Working Group II noted that heavy precipitation events are very likely to increase in frequency and will augment flood risk and the growing evidence of increased runoff and earlier spring-peak discharges in many glacier- and snow-fed rivers (IPCC, 2007). In addition to flood hazards, more extreme rainfall events associated with climate change will also generate increased hazard from landslides in many urban centres.

The IPCC also noted the dramatic impacts on water supplies that are likely under extremes of weather that could arise as a result of climate change. Water supply abstraction and treatment works are sited beside rivers and are often the first items of infrastructure to be affected by floods. Electrical switch gear and pump motors are particularly at risk. In severe riverine floods with high flow velocities, pipelines may be damaged (Wilbanks and others, 2007). Sanitation can also be affected. Flooding often damage pit latrines (and most of Africa's and Asia's urban population relies on pit latrines) and

floodwaters are usually contaminated by the overflow from pit latrines or septic tanks—and often sewers too. Toilets linked to sewers become unusable without a water supply. But most urban centres in sub-Saharan Africa and Asia have no sewers, or if they do, these serve only a very small proportion of the population (Hardoy, Mitlin and Satterthwaite, 2001). As the IPCC noted, the main significance of sanitation here is that its infrastructure (or the lack of it) is the main determinant of the contamination of urban floodwater with faecal material, presenting a substantial threat of enteric disease (Ahern and others, 2005).

3. Storms, sea-level rise and coastal urban populations

An analysis of the number and proportion of urban dwellers (and total populations) living in the low-elevation coastal zone (LECZ - the continuous area along the coast that is less than 10 metres above sea level) found that this represents two per cent of the world's land area but contains 10 per cent of its total population (i.e. over 600 million people) and 13 per cent of its urban population (around 360 million people) (McGranahan and others, 2007, Balk in this volume). This shows that almost two-thirds of the world's cities with more than five million inhabitants have part of their population in this zone. In addition, of the 183 countries with people living in the LECZ, 130 have their largest urban centre extending into this zone. However, most of the urban population living in the LECZ are in urban centres with less than 500,000 inhabitants. There also appears to be increasing population concentrations in the LECZ in most countries (McGranahan and others, 2007; Balk, in this volume).

Obviously, only a proportion of those within this zone are at risk from the sea-level rises that are likely within the next 30 to 80 years. Estimates for sea-level rise vary from 18 cm to 59 cm up to the end of the twenty-first century; these will certainly multiply the number of people flooded by storm surges. One estimate has suggested that 10 million people are currently affected each year by coastal flooding and that the numbers will increase under all the climate change-scenarios (Nicholls, 2004). The problems with coastal flooding will obviously be much more serious if certain potentially catastrophic events whose probability is uncertain were to happen—for instance the accelerated melting of Greenland's ice sheet or the collapse of the West Antarctic ice sheet (IPCC, 2007).

The latest report of the IPCC Working Group II notes the particular vulnerabilities to sea-level rise and changes in run-off of large sections of the urban and rural population in heavily populated Asian deltas such as the Ganges-Brahmaputra (that includes Dhaka), the Mekong, the Changjiang (also known as the Yangtze, which includes Shanghai) and the Chao Phraya (with Bangkok). Many other deltas in Asia and Africa also have large urban and rural populations at risk, especially the Nile but also the Niger (with Port Harcourt) and Senegal (with Saint Louis) and, of course, in the Americas the Mississippi, with New Orleans (Nicholls and others, 2007).

There is some evidence that hurricane-forced winds will become more frequent and intense, and possibly also that the hurricane belt will move southwards. Highly urbanized coasts most at risk therefore include Viet Nam in Asia; Gujarat in Western India and Orissa in Eastern India, the Caribbean (including Mexico's Caribbean coast) and Central America—as was seen from Hurricane Mitch. The intensity of cyclones that currently affect coastal areas in India and Bangladesh are likely to increase. The high concentration of population, especially on the eastern coasts of India and Bangladesh, has led to extremely high vulnerability in this region, leading to very large loss of life and property (Revi, 2008).

4. Constraints on water supplies and other key natural resources

The IPCC Working Group II noted that, in Africa, “by 2020, between 75 million and 250 million people are projected to be exposed to increased water stress due to climate change” (IPCC, 2007, p. 13).

In Asia, “Freshwater availability in Central, South, East and Southeast Asia, particularly in large river basins, is projected to decrease due to climate change which, along with population growth and increasing demands arising from higher standards of living, could adversely affect more than a billion people by the 2050s” (IPCC 2007, p. 13). Any reduction in the availability of freshwater resources caused by climate change will be particularly problematic for those who live in areas already suffering water scarcity or water stress—with poorer groups likely to be most affected (Romero-Lankao, 2006). During the last century, mean precipitation in all four seasons of the year has tended to decrease in all the world’s main arid and semi-arid regions: northern Chile, the northeast Brazil and northern Mexico, West Africa and Ethiopia, the drier parts of Southern Africa, and western China (Folland and others, 2001). If these trends continue, water-resource limitations will become more severe in precisely those parts of the region where they are already most likely to be critical (Rhode, 1999).

Many cities and their water catchments will get less precipitation and have more constrained fresh water sources. This is particularly problematic for growing cities and large cities already facing serious problems obtaining sufficient fresh water supplies (Anton, 1993; UN-Habitat, 2003; UN-Habitat, 2006). At least 14 African countries are already facing water stress or scarcity and many more are likely to join this list in the next 10 to 20 years (Muller, 2007). Independently of climate change, there is already a failure to manage water resources well in much of this region—where around half the urban population already lacks adequate provision for water and sanitation, although this is linked more to inadequate governance than to water shortages (UN-Habitat, 2003a).

5. Higher temperatures and heat waves

Most cities in Africa, Asia and Latin America and the Caribbean will experience more heat waves. Even small increases in average temperature can result in large shifts in the frequency of extremes. For larger, higher-density cities, the temperatures in central “heat islands” can be several degrees higher than in surrounding areas; in tropical cities, the temperature difference can reach 10 degrees by the end of the night (Kovats and Aktar, 2008). Many cities will face more problems with certain air pollutants as their concentrations change in response to climate change because a portion of their formation depends, in part, on temperature and humidity. This has particular importance for Asia and Latin America, which have most of the cities with the highest levels of air pollution. There is less information on the impacts of heat stress in Africa or Latin America but studies undertaken in North America, Asia and Europe found that heat waves are associated with marked short-term increases in mortality (Confalonieri and others, 2007). The European heat wave of 2003 claimed 20,000 lives, mostly among the poor and isolated elderly. In Andhra Pradesh, India, a heat wave killed more than 1,000 people—mostly labourers working outside in high temperatures in smaller urban settlements (Revi, 2008).

In regard to urban heat islands, higher temperatures occur in urban areas than in outlying rural areas because of diurnal cycles of absorption and later re-radiation of solar energy and, to a much lesser extent, heat generation from built/paved physical structures. These increase the frequency and severity of heat-stress events in cities and can affect the health, labour productivity and leisure activities of the urban population. There are also economic effects, such as the additional cost of climate-control within buildings, and environmental effects, such as the formation of smog in cities and the degradation of green spaces—and increased greenhouse gases if additional demand for cooling is met with electricity generated from fossil fuels.

There is some evidence that the combined effects of heat stress (for instance, urban heat-island effects) and air pollution may be greater than the simple additive effects of the two stresses (Patz and Balbus, 2003). There are again different vulnerabilities to the health impacts of climate-related extremes and air pollution within urban areas. Local factors such as climate, topography, heat-island magnitude,

income, access to health services and the proportion of elderly people, are important in determining the underlying temperature–mortality relationship in a population (Curriero and others, 2002).

6. Health risks related to climate change

Climate change is also likely to bring an increased burden of diarrhoeal disease and altered spatial distribution of some infectious disease vectors—for instance as warmer average temperatures permit an expansion of the area in which many “tropical” diseases can occur. Expansion is likely in the area in which the mosquitoes that spread malaria, dengue fever and filariasis can survive and breed (IPCC, 2007; WHO, 1992). Note in particular the rapid spread of dengue fever in many countries in recent years, as the *aedes* mosquito adapts to urban conditions. In India, malaria is expected to expand its range horizontally and vertically, from its currently endemic range in eastern and north-eastern India to western and southern India (Bhattacharya and others, 2006). Given that Indian cities have become major reservoirs of vector-borne diseases such as malaria and dengue fever, it can be expected that the morbidity risks will increase. However, all the above health risks are present for much of the urban population without climate change.

Extreme weather events can generate new health hazards and cause disruption to public health services that lead to increased disease incidence. Hurricane Mitch in Central America in 1998 resulted in increases in cases of malaria, dengue fever, cholera and leptospirosis (Vergara, 2005). Populations with poor sanitation infrastructure and high burdens of infectious disease often experience increased rates of diarrhoeal diseases, cholera and typhoid fever after flood events. The transmission of enteric pathogens is generally higher during the rainy season (Nchito and others, 1998; Kang and others, 2001).

Other health risks that need attention are those related to the lack of disaster-preparedness (to limit the impact of the extreme weather event when it occurs) and the inadequacies or poorly-designed and managed responses after the disaster event (see for instance Bartlett, 2008).

C. WHO IS MOST AT RISK?

Hazards combine with vulnerabilities from extreme weather to produce direct impact on health, living conditions and incomes/livelihoods/assets. The main impact of climate change on urban areas, at least in the next few decades, is likely to be increased levels of risk from existing hazards. For poorer groups, some of the impact is very direct, for example, more frequent and more hazardous floods. Some are less direct, such as, reduced availabilities of fresh water supplies for whole cities that reduce supplies available to poorer groups (or that increase prices). Some are indirect, such as climate change-related weather events bringing about increasing food prices, damaging poorer households’ asset bases or disrupting their incomes. Within the urban poor, certain groups have higher levels of vulnerability, for instance, young children and their carers and the elderly (Bartlett, 2008).

It is well documented that, in most cities, the urban poor live in the most hazardous urban environments, for example, on floodplains or other areas at high risk of flooding or unstable slopes (Hardoy, Mitlin and Satterthwaite, 2001). These are also usually the sites most at risk from climate change, as discussed above. In addition, in most cities, local governments are meant to be the institutions that act to reduce these risks, but they are often unable or unwilling to do so. In part, this is because most of the urban poor live in informal settlements (including many on land occupied illegally) and work within the informal economy (and thus not within official rules and regulations). In part, it is because of the “anti-poor” attitudes among Government officials and elites, so often based on misconceptions. For instance, officials and politicians often assume that those living in informal settlements are unemployed when they work long hours within the informal economy, or that they are recent migrants when they have long worked and lived within the urban centre (or, in many cities, may well have been born there), or that migrants would have been better off if they had not moved (when rural to urban migration flows are

shown to be responses to where economic opportunities are concentrated) (UNCHS (HABITAT), 1996; Satterthwaite, 2007a). One added vulnerability faced by large sections of the urban poor is that governments may bulldoze their settlements to clear them off land-sites deemed to be vulnerable to such things as floods, with very inadequate or no provision for finding alternative accommodation that meets their needs. Even more responsible and accountable urban governments face difficulties in addressing this issue, because low-income groups need central locations in relation to income-earning opportunities and if they have to be moved from hazardous sites, it is difficult to find appropriate alternative sites.

Poorer groups get hit hardest by this combination of greater exposure to hazards (for instance, a high proportion living in makeshift housing on unsafe sites), lack of hazard-removing infrastructure and less capacity to cope (for example, lack of assets and insurance), less adaptive capacity, less state provision to help them cope, and less legal protection or protection from insurance. Wealth allows individuals and households to reduce risks—for instance, by having safer housing, choosing safer jobs or locations to live in, having assets that can be called on in emergencies and protecting their wealth by insuring lives and assets that are at risk. Although it should be through good governance that provision for risk reduction is ensured for the whole city population and disparities in risk between income-groups reduced, wealthier groups usually have more influence on public expenditures and investments. If the Government does not provide these, higher-income groups have the resources to solve most of these problems themselves—for instance by developing their own provisions for water, sanitation and electricity, or moving to private developments which provide these.

The quality of Government—both at the national level and, most importantly, at the local (district or municipal) level—influences the level of risk from climate change facing those with limited incomes or assets in several ways:

- *quality of provision for infrastructure for all areas* (which should limit risks of flooding for the whole city area, not just for the wealthier areas) and land-use management (to limit or make more resilient settlements in high-risk areas);
- *quality of provision for disaster-preparedness* (including warnings, measures taken to limit damage and, if needed, good provision to help people move to safer areas quickly);
- *quality of planning for and coordinating disaster response* (for instance rescue services and appropriate emergency and health care services) and reconstruction (to help those who have lost their homes and livelihoods) which should aim to improve resilience, but seldom achieves this;
- *extent to which poorer groups can buy, build or rent “safe” housing in “safe” sites;*
- *degree to which local government creates an enabling environment for civil-society action to contribute towards addressing the practical aims identified above.*

D. HOW ADAPTATION RELATES TO THE CORE FUNCTIONS OF MUNICIPAL GOVERNMENTS

1. The lack of adaptive capacity

City and municipal governments have the main responsibility for planning, implementing and managing most of the measures that can diminish risks (and the high vulnerabilities of sections of the population) from the direct and indirect impacts of climate change, through the provision of infrastructure and services, disaster preparedness and the planning and regulatory framework.

The IPCC's Fourth Assessment noted the high adaptive capacity that is inherent within well-governed cities (Wilbanks and others, 2007). In high-income countries, urban populations have become so accustomed to a web of institutions, infrastructure, services and regulations that protect them from extreme weather/floods that these are taken for granted. Many of the measures also serve everyday needs as well as protection from extreme weather, for example, through health care services and storm and surface drainage. Early warning of approaching storms is expected, as is a rapid emergency response from the police, health and fire services, if or when needed. In high-income countries, it is very rare for extreme weather events to cause a large loss of life or to seriously injure many people. Occasionally, they cause serious damage to property in specific locations, although for most property owners, the economic cost is much reduced by insurance. All this adaptive capacity is also underpinned by almost all buildings conforming to building regulations and to health and safety regulations and served by piped water, sewers, all-weather roads, electricity and drains 24 hours a day. The cost of such infrastructure and services represent a small proportion of income for most citizens, whether paid direct as service charges or within taxes. City and municipal governments play an important role in most or all of these although this may differ among systems in terms of the roles local government play in planning, providing for and financing provision and in terms of the nature of the local government's relationships to higher levels of government. Private companies or non-profit institutions may provide some of the key services, but it is the local government, local offices, the national or provincial government that provides the framework for quality control. In general, most citizens engage very little in the management of this because it is assumed that Government systems will ensure provision, although there are channels for complaints if needed—local politicians or lawyers, ombudsmen, consumer groups and watchdogs. Thus, the vast majority of urban dwellers are protected from extreme weather without them having to engage in the institutions that ensure such protection. While coverage for some services may be sub-standard and some groups ill-served or excluded, a high proportion of the urban population are well served and well protected. At least for the next few decades, this “adaptive capacity” can certainly deal with most of the likely impacts from climate change in most urban centres in high-income countries. However, there may be some locations that are judged to be too expensive to defend and obviously, the possibilities of adaptation being able to keep down risks depends on effective mitigation.

Whether this high adaptive capacity will actually produce appropriate adaptation is another issue; a detailed assessment of the possibilities and constraints on adaptation around the Gulf of Mexico gave many examples of local governments in the United States of America not fulfilling their responsibilities for risk reduction and allowing buildings and enterprises in high-risk zones; it also gave examples of perverse public policies and subsidies that acted to increase development in high-risk zones (Levina and others, 2007). One post-Katrina assessment noted that municipal governments in the United States of America were still instrumental in increasing population concentration on coasts. “They can disregard federal flood maps, take key decisions on zoning and land use, facilitate drainage and landfill projects, reduce taxes in locally defined enterprise zones... In hazard prone areas, pro-growth initiatives typically outstrip disaster mitigation and these processes erode wetlands, forests and other natural buffers to hurricanes. Coastal regions become more dangerous not just in terms of the growing number of people and properties but also in terms of the increasingly outdated and receding protections from hazards generated by over investment in growth and under investment in environmental sustainability and disaster mitigation” (Elliott, 2008).

But the institutional basis for municipal adaptation is so much weaker in low-income and most middle-income countries. Large sections of the urban population and the urban workforce are not served by a comparable web of institutions, infrastructure, services and protective regulations. It is common for between one-third and one-half the entire urban population to be living in illegal settlements formed outside any land-use plan (Hardoy and Satterthwaite, 1989; Hardoy, Mitlin and Satterthwaite, 2001; UN Habitat, 2003b). These include “squatter settlements” (where the land occupation is illegal) and illegal sub-divisions (where occupation is legal in the sense of involving an agreement with the land-owner but

municipal sub-division and infrastructure regulations are not followed). As noted above, these settlements tend to be concentrated in areas at high risk from extreme weather, precisely because high risk lowers the value of the land and increases the inhabitants' chance of avoiding eviction.

City and municipal governments in low- and middle-income countries generally have the primary role in a great range of infrastructure and service provision that is essential for good quality living standards and for livelihoods—for instance, provision for water, sanitation, drainage and solid waste collection—and often for some schools and health care facilities and for fire and other emergency services (UNCHS (Habitat), 1996; Stren, 1991; Davey, 1992; Shah and Shan, 2006). In general, they also have the primary role in implementing the regulatory framework essential for ensuring public health and safety (for instance through building and sub-division regulations, occupational health and safety, pollution control, traffic control and police) and in theory, a key role in urban planning (and within this land-use management).

Almost all city and municipal governments in low- and middle-income countries fail to meet many of their responsibilities or only meet them for particular sections of their population. This can be seen in the scale of the inadequacies in the provision for infrastructure and services that they are meant to provide (or ensure provision through other providers) and in the extent to which the homes, neighbourhoods and livelihoods of their population fall outside their regulatory framework (UN-Habitat, 1996; Hardoy and others, 2001). However, the scale of these inadequacies varies greatly. At one extreme, there are cities and smaller urban centres where most of the population live in homes and neighbourhoods that are illegal and informal with very inadequate or no public provision for infrastructure and services. For instance, most urban centres in low-income countries in Africa and Asia have no sewers at all, including many major cities and much of the population have no water supply piped to their home and no official solid waste collection service (UN-Habitat, 2003a, 2006; Hardoy and others, 2001). These inadequacies show that local governments lack the resources needed to meet their responsibilities and often have very limited capacities to invest (as almost all local revenues go to recurrent expenditures or debt repayment). They also show that some local governments are unrepresentative, unaccountable and anti-poor—as they regard the population living in informal settlements and working within the informal economy as “the problem.” At the other extreme are examples of cities and smaller urban centres that still have some inadequacies and deficiencies in provision for infrastructure and services but these affect a much smaller proportion of the population. This often reflects city and municipal governments that are more accountable to the citizens in their jurisdiction and within national government structures that have strengthened and supported this level of government—with stronger local democracies in many instances. In many urban centres in Latin America, the quality and coverage of provision for water and sanitation has improved very considerably over the last two decades; there are also many urban centres with close to 100 percent coverage (UN-Habitat, 2006; Heller, 2006). Several countries have also had constitutional or legal changes that have increased the revenues of city and municipal governments and strengthened local democracies (Campbell, 2003; Fernandes, 2007; Cabannes, 2004). There are also an increasing number of local governments that have developed successful partnerships with low-income groups and their community organizations which demonstrate cheaper, more effective ways in which they can meet their responsibilities for infrastructure and services (D'Cruz and Satterthwaite, 2005; Hasan, 2006; Mitlin, 2008).

Many reasons can be given for the inadequacies in local government. In many countries, these include institutional legacies from colonial rule and centralization in post-independence governments. There is also the application of imported models of urban planning and government that proved inappropriate to local contexts and possibilities. For instance, the utility of housing sub-division standards that have minimum lot-sizes and infrastructure standards that make it impossible for most of a city's population to get land for housing is obviously questionable. If half a city's population is living in illegal

settlements and most new housing units are being built in illegal settlements, it suggests that the law is at fault, not the illegal housing and settlements.

But in the last two decades or so, other factors have contributed including the external pressures for dismantling or weakening the state and support for deregulation and privatisation (Rakodi, 1999). This was driven by the hope that this would help underpin stronger economies. It can be argued that the lack of progress in most urban centres in improving provision for water and sanitation over the last 20 years was the result of many international agencies greatly overestimating the potential role of privatisation to improve and extend provision (Budds and McGranahan, 2003; Warwick and Cann, 2007). In addition, although international agencies began to recognize the importance of supporting “good governance” in the early 1990s, their “good governance” programmes were generally at the national level with little attention paid to increasing the competence, capacity and accountability of local governments (Satterthwaite, 2005).

There is also the fact that most bilateral aid agencies and many international non-governmental organizations (NGOs) refused to work in urban areas, underpinned by a belief that urban populations benefited from “urban bias.” There may be some evidence of particular cities benefiting from an urban bias in government policies and expenditures but in general this bias brings little or no benefit to the majority of those living and working in these cities—especially low-income groups. The deficiencies in provision for water and sanitation in urban areas were noted earlier. In many low-income nations, infant and child mortality rates among urban populations are five to twenty times what they would be in a healthy, well-served urban population (Montgomery and others, 2003; Satterthwaite, 2007b). Just because hospitals, universities and investments in piped water supplies and sewers are concentrated in particular cities, it does not mean that their low-income population get access to them. In addition, in most countries, there is little or no evidence of policy or expenditure biases benefiting most urban centres (Satterthwaite, 2007a; Corbridge and Jones, 2005). The backlog in the population lacking provision for infrastructure and services continues to grow in most urban centres in low-income countries, as the powers and resources available to city or municipal governments bear little relation to their responsibilities.

2. The roles and responsibilities of urban governments

It is important to understand the scale and scope of local government involvement in urban centres, if their role in adaptation to climate change is to be understood. Urban governments typically have a range of roles that can be ordered under the eight headings listed below—although with many differences as to how these are arranged (or combined) within each urban centre and how lines of authority and accountability are structured between politicians and civil servants. Of course, there are also very large differences in the scope of their responsibilities within each of these and the competence with which these are fulfilled.

Generally there are divisions of departments for:

- **Finance:** Budget/accounts management (which may also manage local government tenders) and revenues (managing the collection of whatever taxes or charges permitted to local governments; these may include a range of licenses that are important for control too).
- **Engineering/Public works:** usually includes road repair and maintenance within their jurisdiction, street lights, management of government buildings and perhaps of some public housing stock.
- **Development planning and development control:** building control/inspection, land use planning and management (including regulation), property registration and urban plans.

- **Environmental health:** water, sanitation, storm and surface drainage (although this may be lodged within public works), implementation of environmental health regulations within certain enterprises (for instance restaurants, cafes and hotels, slaughterhouses, markets) and public areas (although some of these may be lodged in other divisions).
- **Public health:** Medical services (including hospitals and health care centres), solid waste collection and management.
- **Social/community/safety services:** Some of the items listed above under environmental and public health may be within this. Often traffic management and management of social housing, libraries, some role in public transport, some role in schools and kindergartens (although usually with responsibilities shared with higher levels of government), youth policy, sport and recreation, parks; sometimes local police.
- **Emergency services:** fire services, ambulances, some of the responsibility for disaster response.
- **Administration:** usually including human resources and often includes the registration system for births and deaths and marriages.

Many city governments also have departments for promoting local economic development and some also have roles within electricity production or distribution.

It is easy to list a set of local government responsibilities for infrastructure, buildings and services that have great importance for the four critical aspects of adaptation: long term protection, pre-disaster damage limitation, immediate post-disaster response, and rebuilding (see table 2). It is also easy to point to large inadequacies in what is provided. Perhaps the main use of table 2 is to highlight just how many areas of local government should be active in adaptation. But there is such diversity in the forms of local government and their relationships to higher levels of government that it is impossible to generalize in regard to: (a) how much of these fall to local governments to fulfil; and (b) the extent of local government engagement with each of these in terms of who has responsibility for planning, constructing and maintaining the buildings and infrastructure or providing the services, coordination, finance, monitoring and regulation.

There are also no obvious generalisations in regard to the “best” local government structures. For instance, it can be argued that local governments with a high reliance on intergovernmental transfers for funding infrastructure and services are at a disadvantage because this reduces the link between local needs and local resources—but some countries with cities with high adaptive capacity have such a high reliance. The need to root adaptation in local contexts and realities suggest primary roles for local governments, yet local governments often focus on short-term goals and often prioritize economic growth over longer-term risk reduction.

Clearly, adaptation involves changes in policies and practices within many parts of local government. The key question: is there a mechanism by which these can be encouraged and integrated? If there is a strong local development plan that provides the framework for future investments and land use management, then it is possible to incorporate adaptation measures into this. But for so many urban centres, there is no such development plan—or if there is, much new investments, urban developments and buildings fall outside it.

TABLE 2. THE ROLE OF CITY/MUNICIPAL GOVERNMENTS IN ADAPTATION

<i>Role for city/municipal government</i>	<i>Long term protection</i>	<i>Pre-disaster damage limitation</i>	<i>Immediate post-disaster response</i>	<i>Rebuilding</i>
<i>Built environment</i>				
Building codes	High		High ¹	High
Land use regulations and property registration	High	Some		High
Public building construction and maintenance	High	Some		High
Urban planning (including zoning and development controls)	High		High ¹	High
<i>Infrastructure</i>				
Piped water including treatment	High	Some	High	High
Sanitation	High	Some	High	High
Drainage	High	High ²	High	High
Roads, bridges, pavements	High		High	High
Electricity	High	Some?	High	High
Solid waste disposal facilities	High	Some?		High
Waste water treatment	High			High
<i>Services</i>				
Fire-protection	High	Some	High	Some
Public order/police/early warning	Medium	High	High	Some
Solid waste collection	High	High ²	High	High
Schools	Medium	Medium		
Health care/public health/environmental health/ambulances	Medium	Medium	High	High
Public transport	Medium	High	High	High
Social welfare (includes provision for child care and old-age care)	Medium	High	High	High
Disaster response (over and above those listed above)			High	High

Source: Satterthwaite (2007). Integrating Adaptation to Climate Change in Decision-making at the Urban/Municipal Level in Low- and Middle-income Countries, (first draft), prepared for the OECD Development Assistance Committee, OECD: Paris.

NOTE: The actual allocation of responsibility and of access to funding between city/municipal governments and other institutions will obviously differ between countries; the intention of this table is to make clear the many roles city/municipal governments should have in adaptation. High denotes that they have the sole or main responsibility; medium indicates that they have substantial responsibility; some means some role or responsibility but with other institutions having the main responsibilities.

¹ Obviously it is important that these do not inhibit rapid responses.

² Clearing/desilting drains and ensuring collection of solid wastes has particular importance just prior to extreme rainfall; many cities face serious flooding from heavy rainfall (for instance the monsoon rains) and this is often caused or exacerbated by the failure to keep storm and surface drains in good order.

3. Formulating and implementing adaptation policy

Most urban governments in low- and middle-income countries have not considered adaptation seriously. For instance, in India, Chile, Argentina and Mexico, the central Government is beginning to take an interest in adaptation, but this interest has yet to engage the interests of the larger, more powerful national ministries or agencies or city and municipal governments (Satterthwaite and others, 2007). It is likely that there is considerable confusion among many local government politicians and civil servants in regard to climate change and to what responses they should make. Even among the cities in high-income countries with the greatest awareness of climate change—and that have made substantial efforts to reduce emissions—there has been no move on adaptation (Ligeti and others, 2007). Of course, this lack of attention to adaptation is not helped by the lack of locally relevant data on the likely direct and indirect impacts of climate change in each urban area. The city of Durban in South Africa is unusual in having developed an adaptation programme as described below in box 1.

Box 1: Durban's adaptation programme

Durban, South Africa, established an Environmental Management Department in 1994. Much of the initial work of the Department was to see how the municipality's strong developmental orientation could incorporate pressing environmental concerns. Durban was one of the few cities in Africa to have a Local Agenda 21, in line with what the world's governments agreed to at the United Nations Earth Summit in Rio de Janeiro, Brazil in 1992. Various departments within the municipal government also became aware of the need to factor climate change into their plans—for instance for water supply and health care. But municipal officials are unlikely to act if they have little idea of what climate change means for their city. To address this, the Environmental Management Department initiated the development of a Climate Protection Programme in 2004. The roll-out of this programme has occurred in three phases:

Phase 1: Reviewing and developing an understanding of the global and regional climate change science and translating this into an understanding of the implications of climate change for Durban. Key impacts include increases in temperatures, changes in the distribution of rainfall (long periods of no rainfall punctuated by short periods of intense rainfall), decreased water availability, increased range of water and vector borne diseases, sea level rise, and the loss of biodiversity.

Phase 2: Developing a "Headline Climate Change Adaptation Strategy" for the city to highlight how key sectors within the municipality should begin responding to unavoidable climate change. Interventions that seek to enhance and expand existing initiatives (such as the modelling of vector-borne diseases and their relationship to climate change) or stimulate new activity such as the "climate-proofing" of the city's open space system through matrix management (i.e. the management of the urban landscapes surrounding natural areas in a way that assists the survival and dispersal of indigenous species) and the creation of north-south dispersal corridors.

Phase 3: Incorporating climate change into long-term city planning, which includes developing a model enabling the simulation, evaluation and comparison of strategic urban development plans within the context of climate change. This seeks to understand the effects of climate change in Durban and allow a model-based assessment of the effectiveness of alternative approaches to mitigation and adaptation. This will involve the use of greenhouse gas emissions accounting (i.e. producing an inventory of all the greenhouse gases produced by activities within the Municipal area) together with an assessment of the city's vulnerability in key sectors such as health, water and sanitation, coastal infrastructure, disaster management and biodiversity.

Source: Roberts (2008).

Perhaps the two key messages that will get the attention of city/municipal governments are:

1. The very large overlap between most of the measures needed for adaptation and local development (especially improving and extending provision for piped water, good sanitation and drainage, solid waste collection and disposal, prevention-focused health care and support for upgrading within informal settlements);
2. The very large overlaps between climate-change adaptation and building resilience to extreme weather/disasters (regardless of whether the extreme weather or other catalysts for disasters are related to climate change).

The key to adaptation in most instances is competent, capable, accountable urban governments that understand how to incorporate adaptation measures into most aspects of their work and departments. Many needed measures may seem to be quite minor adjustments to current practices—for instance in adjusting building codes, land sub-division regulations, land-use management and infrastructure standards—but the sum of all the minor adjustments over time can build greater resilience without high costs. The urban centres that face the greatest challenges are those in the more high-risk sites that lack competent, capable, accountable local governments—and very often have large backlogs in protective infrastructure and services.

As table 2 makes clear, good adaptation will need to involve a range of urban government divisions and departments, some of which may be semi-autonomous public agencies. It will often need to involve many government agencies that work within sub-city or municipal levels and at higher

(provincial/state and national) levels. It is difficult to specify the most appropriate intervention points within local government structures. First, this depends on the structure of the city or municipal government and often also on higher levels of government (which may control or have a major role in many city-level aspects of government). Super- or supra-government levels are often important—for instance for many urban centres, there are key functions managed at sub-municipal level (for example, district or ward level). Many large cities are also formed by many separate municipalities with serious constraints on inter-municipal cooperation (for instance, as they are governed by different political parties) and with great variation in the extent of functions managed at a higher (metropolitan or provincial) level. There is also the need to engage a great variety of local government staff—from elected councillors to technical discussions with particular specialists and specialist departments.

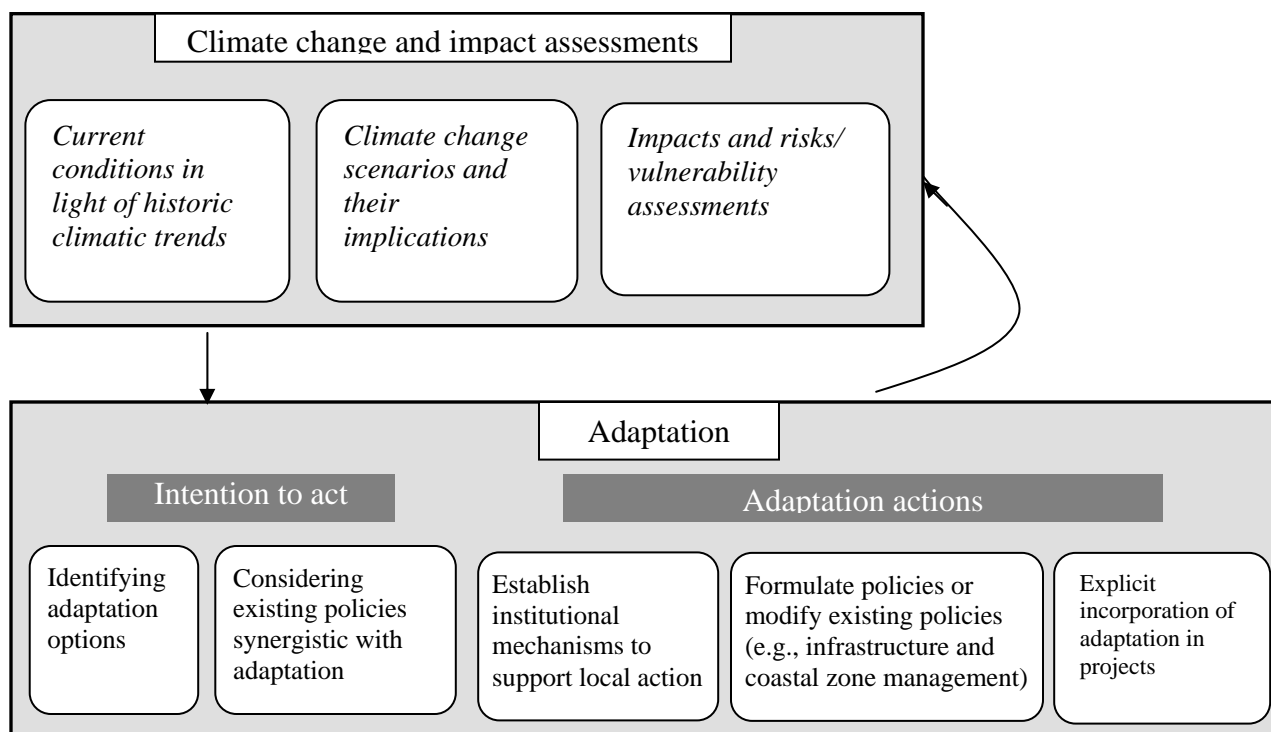
4. The interventions needed to adapt to climate risks

1. *Develop an information base on current conditions.* An important part of this is considering the impact of past extreme weather and other disasters on each city or municipality. This should seek as much detail as possible, drilling down to include “small disasters” (disasters that do not get included in international disaster databases).² This can draw on the DesInventar methodology developed in Latin America and now widely applied elsewhere which looks more intensively at disasters in any locality and includes “small disasters.” For instance, a database in Cape Town that sought to record all events registered over 12,500 incidents which contrasts with the 600 identified large events and declared disasters (Bull-Kamanga and others, 2003). Almost half of these occurred in informal settlements. An analysis of disaster events in Mexico, 1970 to 2001, sought to document all events with at least one mortality and found that floods were the most common disaster, and a quarter of all deaths from flooding came from events with fewer than four deaths (DesInventar web site)—i.e. much too small to be included in international disaster datasets (see Awuor, Orindi and Adwerah, 2008, for an example of this for Mombasa).
2. *Initiate risk/vulnerability assessments for the city* with as much geographic detail as possible; these should be linked to hazard maps with details of what is currently located within the hazardous zones—including identifying population groups or settlements most at risk and activities that may pose particular risks (for instance water treatment plants beside rivers). From this, an assessment can be developed of whether the infrastructure and buildings will be able to withstand extreme events.
3. Based on the above, discuss how addressing the above can be incorporated into the different aspects of local government.

This whole process should be seen as useful far beyond climate-change adaptation as it documents and maps other key environmental hazards and who is most at risk from them.

There may need to be a “prequel” to the above to convince urban governments of the need to initiate this. A review of progress in countries of the Organization for Economic Cooperation and Development (OECD) on adaptation to climate change produced a useful figure, showing key stages in moving from assessing impacts to intention to act and finally implementing adaptation options (see figure 2). Although this diagram was intended to reflect national processes, it can equally be applied to city governments. In most low- and middle-income countries, it is likely to need innovation and leadership from local governments not only to demonstrate what is possible but also to help set or improve national policies.

Figure 1. Moving from assessment to intention to act and finally adaptation actions



Source: Based on figure 6 in Gagnon-Lebrun, Frédéric and Shardul Agrawala (2006), *Progress on Adaptation to Climate Change in Developed Countries; An Analysis of Broad Trends*, env/EPOC/GSP(2006)1/FINAL, OECD, Paris, 59 pages.

E. GOOD LOCAL GOVERNANCE AND DEVELOPMENT ASSISTANCE

It could be argued that there needs to be a very large increase in the international funding available for investment to address the backlog in urban infrastructure and services. This is an important area to which new and expanded funding for climate change adaptation should be directed. If international donors want to focus such funding specifically on adaptation, this would be problematic—not least, because of the need for so many cities to adapt to climate variability when the role of climate change in such variability is not known. From a development perspective, it is difficult to separate funding and implementation for adaptation to climate change risks from funding and implementation to improve and extend provision for infrastructure and services to reduce other environmental risks (including those arising from climate variability and earthquakes). It may be necessary to distinguish between the responsibility (and hence liability) of high-income countries to pay for adaptation in low- and middle-income countries to protect against the increased risks from climate change caused primarily by high-income nations' past and present greenhouse gas emissions. Thus, funding for climate change needs to be in addition to existing development assistance flows—even if the funding it provides needs to be strongly integrated within development investments.

But increasing funding flows for adaptation will not achieve much unless the local government has the capacity to use it well and to work well with groups most at risk. This presents more difficulty for official development assistance agencies than the actual funding. Developing more competent and accountable city and municipal governments is a complex and usually highly contested process. It is very difficult for any external organization, however well informed, to know how best to support this. In

addition, official development assistance agencies have to work with and through national governments, which often oppose changes recommended by development assistance agencies, even if the existing evidence suggests that changes such as decentralization of decision-making and revenue-raising powers are necessary. There are also obvious political difficulties such as national governments not wanting to channel resources to city governments in which opposition parties predominate. In addition, official development assistance agencies are not set up to support the kind of long-term local engagement that supports the enhancement of local adaptive capacity. The boards or governments that oversee official development assistance agencies bring strong pressures to minimize staff costs (seen as a key measure of efficiency), produce tangible measurable results and limit the duration of any initiative. There is often a strong pressure to spend—or for the development banks to increase their loans. This is not the appropriate financial framework to support them working with national and local governments to build the competence, capacity and accountability of city and municipal governments and local government-grassroots organizations partnerships. To do this is likely to be a slow process in most countries; it needs a long engagement. It is difficult to measure its effectiveness with conventional quantitative indicators. Ironically, in most instances, one sign of progress would be to minimize the amount of external funding needed, because to sustain this process and to allow it to expand to reach a high proportion of all urban centres, it needs to develop models that can be sustained primarily by local resources.

If development assistance agencies accept the need to support more competent, effective, accountable pro-poor city and municipal governments—for climate change adaptation and also for more effective development—they will need some significant changes in how they structure development assistance. It will need their long-term engagement to support this and innovative financial systems that allow support to flow rapidly and easily to a multiplicity of locally-determined initiatives. What is possible and what should be prioritised in any nation obviously depends on the competence, capacity and accountability of local governments. Table 3 illustrates this by highlighting the different local government contexts with which external donors would have to work if consideration is given to these.

TABLE 3. DIFFERENT LOCAL CONTEXTS THROUGH WHICH NATIONAL GOVERNMENTS AND INTERNATIONAL AGENCIES CAN PURSUE “GOOD GOVERNANCE” FOR ADAPTATION

<i>Resources available to local government</i>	<i>The quality of local government/governance</i>	
	<i>From democratic and accountable local government structures...</i>	<i>...to undemocratic, unaccountable and often clientelist local government</i>
From relatively well-resourced, local government institutions with the needed technical competence...	Local government can be well served by external funding, including funding to support adaptation by households and private enterprises, and funding for needed infrastructure and support services (whether provided by community organizations, NGOs, private enterprises or government agencies)	Long-term support needed for governance reforms at all levels of government; also support needed for local private and community provision both to improve conditions and to build local pressure on government for better governance
...to poorly resourced local governments lacking funding, a strong local revenue base and technical capacity	Need for a strong focus on capacity building for local government and support for its partnerships with civil society and local private-sector infrastructure and service providers (including informal providers)	As above but with strong support for local private providers and community provision within a long-term goal of supporting more competent, accountable and transparent local government

Source: Satterthwaite, David (2007), *Integrating Adaptation to Climate Change in Decision-making at the Urban/Municipal Level in Low- and Middle-income Countries*, (first draft), prepared for the OECD Development Assistance Committee, OECD, Paris, 33 pages.

An important part of building local adaptive capacity is supporting adaptation that serves low-income groups, especially those that live in homes and locations most at risk from the direct and indirect impacts of climate change. There are good experiences from which to draw on “slum and squatter upgrading” in which local governments have worked with the inhabitants of informal settlements to provide infrastructure and services and improve the quality of housing (see, for instance, Boonyabancha, 2005). There are also many examples of “upgrading” and of new housing developments undertaken by federations formed by “slum” or “shack” dwellers themselves that are both more effective and less costly

than those supported by international agencies—and where these receive support from local government, these have demonstrated a very considerable capacity to “go to scale”, as it is the case of India, South Africa, Thailand and Malawi (Boonyabancha, 2005; Burra, 2005; D’Cruz and Satterthwaite, 2005; Manda, 2007; Muller and Mitlin, 2007). But these kinds of grassroots initiatives also require donor support. This should not be seen as funding alternatives to local government but as central to building the competence, capacity and accountability of local governments.

Thus, in conclusion, support for adaptation to climate change needs to think through the financial systems and mechanisms that will allow support for a multiplicity of city or municipal innovations by local governments and by grassroots organizations—and that reinforces and works with “good local development” and “good local governance.” The current focus on National Adaptation Programmes of Action (NAPAs) and on community-based adaptation leaves out the key role of local government (although some community-based adaptation has involved local governments). There need to be local LAPAs and city Community Action Plans (CAPAs) to underpin and drive innovations in NAPAs.

It is also important to stress that in almost all instances, there needs to be development and adaptation. Even competent and accountable national and local (city and municipal) governments will not engage with adaptation to climate change unless it is seen as supporting and enhancing the achievement of development goals. This also implies drawing on the knowledge of the few official development assistance agencies with experience in urban development.

Obviously, there is need to consider how urban adaptation can also contribute to mitigation in all countries and there are some obvious complementarities between the two. But some care is needed in this, especially in assumptions that measures that reduce greenhouse gas emissions necessarily serve adaptation or development. Because mitigation in high-income countries focuses so strongly on increasing energy efficiency, there is often an assumption that the measures used to achieve this should be transferred to low and middle-income countries even as some of these countries have one-fiftieth or even one-hundredth of the carbon emissions per person of high-income countries. In most urban centres in low- and middle-income countries, adaptation priorities need to focus on the expansion and improvement of protective infrastructure and services, not on energy efficiency.

Finally, there is also an obvious need to draw on the “disaster-preparedness” community of scholars and activists who have transformed our understanding of what causes disasters and the extent to which “natural” disasters are preventable (because the actual disaster has so much to do with inadequate planning and infrastructure and lower-income groups having no alternative but to live in high risk areas). It is surprising that they have not had a more central role in adaptation, given how much they can contribute to understanding the possibilities and constraints on adaptation that reduces risks from disasters.

NOTES

1. The text of this paper draws on a collaborative work programme on the possibilities and constraints in regard to adaptation to climate change in urban areas in low- and middle-income countries that involves many individuals and institutions. In particular, it draws on the author's work with Saleemul Huq and Hannah Reid (IIED's Climate Change Group), Mark Pelling (Kings College, University of London), Aromar Revi (TARU) and Patricia Lankao Romero (National Center for Atmospheric Research, USA). It also draws on material prepared by Debra Roberts (case study on Durban's adaptation strategy), Jorgelina Hardoy and Gustavo Pandiella (background paper on Argentina), Karina Martínez, E. Claro and Hernando Blanco (background paper on Chile), Cynthia B. Awuor, Victor A. Orindi and Andrew Adwerah (background paper on Mombasa), Mozaharul Alam (background paper on Bangladesh/Dhaka), Sheridan Bartlett (background paper on the impacts of climate change on children) and Sari Kovats. As such, it also draws heavily on two previous papers: Satterthwaite, David (2007), *Integrating Adaptation to Climate Change in Decision-making at the Urban/Municipal Level in Low- and Middle-income Countries* (first draft), prepared for the OECD Development Assistance Committee, Paris and Satterthwaite, David, Saleemul Huq, Mark Pelling, Hannah Reid and Patricia Lankao Romero (2007), *Adapting to Climate Change in Urban Areas; The possibilities and constraints in low- and middle-income countries*, IIED Working Paper, IIED, London, 107 pages.
2. The Centre for Research on the Epidemiology of Disasters (CRED), which holds the only publicly accessible global disaster database, defines disaster as "a situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance." To be entered into the EM-DAT database, at least one of the following criteria has to be fulfilled: 10 or more people reported killed; 100 people reported affected; a call for international assistance; and/or declaration of a state of emergency; CRED EM-DAT; see <http://www.em-dat.net/>. See also International Federation of Red Cross and Red Crescent Societies 2002.

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