Urban Population, Development and Environment Dynamics

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URBAN POPULATION, DEVELOPMENT AND ENVIRONMENT DYNAMICS

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1. Introduction[1]

The focus of this paper is on the dynamics of population, development and the environment in urban areas of low-income developing countries. In addition to drawing on the broader literature, this paper also relies on the findings from PRIPODE research programme, which sponsored population, development and environment (PDE) research in several least developed country cities.[2]

Rapid urbanization in the poorest countries is straining the capacity of cities to provide basic amenities, degrading the quality of life, and impoverishing the environment. Although the same strains on quality of life, health, and the environment were evident in the earlier urban transition in the industrialized world, there are significant differences between the two transitions.

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[1] This CICRED Policy Paper is based on a longer, more detailed background paper prepared for the PRIPODE International Colloquium held in Paris in March 2007. The original draft paper is available from the Colloquium's webpage: http://pripode.cicred.org/CONF/UNESCO2007/EN/Presentation.htm

[2] "PRIPODE studies are referred to by code number (e.g., VN5 for Ho Chi Minh, Vietnam, GH1 for Accra, Ghana). A full list is given in the appendix to this Policy Paper, and more detailed findings for each study can be found at http://pripode.cicred.org.

Firstly, the sheer numbers of people taking part in it are of a dramatically different scale. Secondly, owing to complex changes in the global economy, the prospects for economic development among the poorest countries are not nearly as bright as the situation faced 150 years ago by today's industrialized countries. Lastly, the global environmental context has changed dramatically, and today there is real concern about the impacts of further industrial development in the face of climate change and the rapid loss of ecosystems.

Unfortunately, instead of bringing economic dynamism, improved health, tougher environmental standards, better education, and growing democratization, urbanization in many least developed countries is accompanied by economic stagnation, negligible health gains, lax environmental standards, low education levels, crime and social instability. We point out from the outset that this need not necessarily be the case; that urbanization is perhaps one of the best hopes for development and environmental stewardship for low-income countries.

This paper is organized in sections addressing first population (Section 2), then development (Section 3), then the environment (Section 4), considering in each section the interplay of all three. A final section (Section 5) is reserved for a discussion of policy implications and solutions.

2. Population Dynamics

In this section we will first describe current trends in developing country urbanization and their determinants, and then describe the specific trends identified in the PRIPODE studies.

2.1. Urban Growth: Trends, Misconceptions and Policies

At the present time, some 3.2 billion people already live in towns and cities; this is expected to rise to almost 5 billion by 2030. In comparison, the world's rural population is expected to decrease by some 28 million between 2005 and 2030. Ergo, at the global level, all population growth in the future will be in towns and cities. No less than 97 per cent of this huge absolute increase in urban population will accrue to developing regions. Asia

will be, far and away, the primary site of all future growth, followed by Africa and then Latin America.[3]

Urban growth is increasingly being recognized as one of the critical development issues of the 21st century. Yet discussions in the media and even among policymakers persistently make three erroneous assumptions about ongoing trends. It is generally assumed that: a) current trends are due to an unprecedented rapid rate of urban growth; b) most urban growth is occurring in megacities; c) most urban growth is due to migration from rural to urban areas. All of these assertions are in fact misleading and can lead to erroneous policy decisions as we will briefly show.

As observed in a seminal study by the US National Academy of Sciences, the main difference between the current urban transition in developing countries and the past experience of Europe and the United States lies in the *unprecedented scale of change* (Montgomery et al. 2003). The real story here is no longer the rapid rates of city growth but *the absolute size of the increments* in the urban population of less developed regions. Between 2000 and 2030, according to the latest UN estimates, the urban population of the developed world is expected to grow only from 870 million to 1.01 billion (Figure 1). That of Latin America and the Caribbean will increase from 394 to 609 million, while Asia's will grow from 1.36 billion to 2.64 billion, and Africa's from 294 to 742 million. By 2030, Africa, Asia and Latin America will include 8 out of every ten urban inhabitants in the world. And this unprecedented scale of urban growth is occurring despite a significant decline in actual *rates* of growth of the urban population.

As concerns the evolution of mega-cities, it is true that they have obviously grown in size and number in the last few decades. As countries urbanize, they inevitably develop one or more large agglomerations, often incorporating two or more large urban cores (Jones and Visaria 1997). In 1950, the world knew of only one behemoth (New York) having more than 10 million inhabitants: by 2005, there were 20 such mega-cities, 15 of which were located in less-developed regions and, by 2015, there will be 22 of them. However, the growth in the number and size of such cities has been much slower than predicted in earlier decades. Today, mega-cities account for 4

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[3] Unless otherwise mentioned, all data referring to the analyses of urbanization trends provided in this paper are based on: United Nations. 2006. *World Urbanization Prospects: The 2005 Revision*. New York: Population Division, Department of Economic and Social Affairs, United Nations.

per cent of the world's population and 9 per cent of all urban inhabitants; this is undoubtedly an important slice, but not one that is expected to expand quickly in the foreseeable future as the growth of the major megacities has slowed down and will continue to do so, both in more and less developed regions.

A fact that has garnered much less attention but which is actually more important for the planning of our urban future is that small and intermediate cities are where most urbanites live. At the present time, 52 per cent of the urban population still lives in "small and intermediate cities" (labelled by the UN as localities having a population of fewer than 500,000 people; United Nations 2006). Moreover, contrary to popular opinion, this ascendancy of smaller cities will persist in the foreseeable future. Thus, it is expected that, in the future, most urban growth will actually take place in urban locations having less than 500,000 people. This observation concerning the prevalence of smaller towns and cities in the urban future of less developed regions is of the utmost significance in any effort aimed at improving the lives of urban dwellers in the future.

As regards the sources of urban growth, most people assume that rural to urban migration is the main demographic cause. Thus, policymakers have increasingly tried to reduce urban problems by deviating migratory movements from cities to other rural destinations and/or dissuading migrants from coming to cities. The latest comprehensive effort to separate out the components of urban growth put the contribution of natural increase at about 60 per cent in the median country (Chen et al. 1998). The remainder is the result of a combination of migration and reclassification. The important point is that, over time, the ascendancy of natural increase in urban growth will inevitably grow as urbanization (i.e. the rise in the proportion of the total population living in urban areas) progresses.

In short, urban administrators wishing to reduce urban growth thus need to give greater attention to the factors that affect fertility decline rather than to migration. At any rate, attempts to prevent rural-urban migration have generally met with failure.

2.2. Urban Growth in the Case Studies

Each of the five PRIPODE case study cities is experiencing rapid growth in excess of 3 percent per annum. Here we present the population and eco-

nomic profiles of each city, with particular reference to their growth trends, starting with Ho Chi Minh City and then moving to Africa.

Ho Chi Minh City (VN5) is the largest city in Vietnam and is located near the Mekong River delta. The city centre is situated on the banks of the Saigon River, 60 km from the South China Sea. It is the most important economic centre in Vietnam. Some 300,000 businesses, including many large enterprises, are involved in high-tech, electronic, processing and light industries, also in construction, building materials and agro-products (Wikipedia 2006a). The economy is growing at an astounding 11% per annum (Le *et al.* 2006).

In the VN5 study, the researchers found that the city grew from roughly 5 million people in 1997 to more than 6.2 million in 2005, or a 2.8% annual rate of growth. Recent rates are in excess of 3 percent. Natural increase was almost twice as important as migration in 1997, but between 2003 and 2005, this trend was reversed, with migration contributing roughly 63% of the total growth.

Moving over to Africa, where the remaining PRIPODE urban studies are located, four cities were studied (from east to west): Kampala, Brazzaville, Lagos, and Accra. Kampala is typical of many primate cities in Africa, insofar as it grew from the seat of a tribal kingdom (the Buganda) to become a colonial outpost of the British Empire, to eventually becoming the nation's capital, replacing Entebbe at independence. Since that time its population has grown at an annual rate of more than 5.5 percent, effectively doubling every 12 years. Kampala has grown in part by engulfing former satellite towns, which has yielded a metropolitan area spanning approximately 386 square kilometres (UG4). As a classic primate city, it houses 1.2 million people, which is 12 times larger than the next largest city, Jinja, and 40% of Uganda's urban population. What little industrial activity the country has is largely concentrated in the capital, and being the seat of national government, this is where most civil service jobs are also located.

Brazzaville is the capital and largest city of the Republic of the Congo and is located on the Congo River, across from Kinshasa, the capital of the Democratic Republic of Congo. More than a third of the population of the Republic of Congo lives in the capital, and it is home to 40% of the country's non-agricultural employment. Like Kampala, it serves as the financial and administrative capital, and many of the nation's small industries (e.g., drink and tobacco packaging, wood and metal working, food processing, construction, and chemical plants) are concentrated there. According to the

PRIPODE study, based on 2005 census data, Brazzaville had a population of 1.2 million, having grown at a rate of 3.3% per year from 856,400 in 1996 (CG1 study). Although the precise proportions attributed to natural growth and migration are not known, large population displacements from rural areas, owing to civil strive and the effects of structural adjustment programs, have contributed to the city's rapid growth.

At more than 12 million people, Lagos is the largest of the cities considered by the PRIPODE teams. The 2006 Census has reported national level results, but disaggregated results by city have yet to be released. The UN, however, projects a population of 20 million people by 2010, with an annual growth rate of more than 4 percent. Unlike the other three African cities considered here, Lagos is not the capital, but it is the economic hub of the country, concentrating financial services, industry, and port facilities for the whole country (Wikipedia 2006b). Rural-urban migration rates are assumed to be quite high due to "loss of prime rural land and weakening of…traditional land management systems, lack of local multiplier effects needed to stimulate agro-industry and non-agricultural job creation in the region as well as disintegration of local cultural relations and institutions" (NG1).

Finally, Accra has a population 1.97 million in 2005 (Wikipedia 2006c), playing host to one-fifth of Ghana's total population (Boadu 2001). The population growth rate is estimated at 3.4 % per annum in the city itself but up to 10% in its peri-urban districts (RUAF undated). It is Ghana's largest city and its administrative, communications, and economic centre. Like Lagos, the primary economic activities are financial and government services, communications, construction, transportation and agriculture (including fishing). More than 70% of Ghana's manufacturing capacity is located within the capital area (Wikipedia 2006c).

As can be seen, these PRIPODE cities are broadly representative of the overall trends in developing country urbanization described in section II.a. Although statistics are somewhat unreliable for many African cities, population growth rates exceeding 3 percent are resulting in economic and environmental stresses that will be described in greater detail in the sections below.

3. Economic Development

Population dynamics are intimately connected to economic development in developing country urban areas. On the one hand, the economically active population forms the labour pool for urban areas. Because of the shortage of formal employment opportunities in the public and private sectors (owing to the effects of structural adjustment programs and competition stemming from economic globalization), many developing country cities have burgeoning informal sectors. On the other hand, economic development, and particularly changes in urban land markets, when coupled with population trends, has tended to lead to a process of urban spatial expansion into peri-urban areas. We begin here by discussing the formal sector, then look at aspects of the informal sector, and finally turn to peri-urban development and land speculation.

3.1. Public and private sector

Inurah *et al.* (2004) point out that many medium sized cities find themselves unable to attract the external investment that would lead to job creation or that would provide the tax revenues necessary to create supportive infrastructures. According to their analysis, cities in low and medium-income countries suffer from two disadvantages. First, in terms of business opportunities, their markets are weak due to high levels of unemployment, low skill levels, low incomes and a weak infrastructure base. Second, weak governance, unstable political environments, the prevalence of corruption, high levels of crime and threats to property rights are viewed as major threats and risks to investment.

The results are high establishment and transaction costs that make these cities unattractive to global capital. This contributes to a vicious circle in which there is no or little economic growth, high unemployment and poverty, a weak revenue base, declining competitiveness and attractiveness, and thus further economic stagnation. That Inurah *et al.* find this dynamic operating in two reasonably prosperous African cities – Johannesburg, South Africa, and Gaberone, Botswana – bodes ill for the many less advantaged cities of that continent and elsewhere. Furthermore, lack of education and training for industry or service sector jobs means that many city dwellers or recent migrants do not stand a chance of employment in these sectors – in fact, even well-educated workers find a paucity of decent jobs. In recent years there have been ominous predictions of the impacts of the "youth

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bulge" – the large number of un- and under-employed men under 30 – on social and political stability. Whether or not these dire predictions are borne out – the presence of high fertility and continued in-migration, despite economic stagnation, paints a somewhat worrisome scenario in which far from being engines of growth, the cities may easily concentrate some of the worst societal problems.

The problem of economic stagnation in the face of rapid population growth is characteristic of most African cities. By contrast, many cities in low-income Asia – including many in India, China, and Vietnam – are experiencing unprecedented economic booms. As noted earlier, Ho Chi Minh City (VN5) has experienced very rapid growth between 2002-2005. . In the context of such an astounding growth rate, employment represents less of a problem than provision of services and infrastructure to new homes and enterprises. In fact, the unemployment rate has declined from 10.3 to 8.8% since 1997, despite a population growth rate in excess of 3%.

3.2. The urban informal sector

According to Hinrichson (2002), most urban poverty does not result from a lack of jobs, but from a lack of well-paying, steady jobs. Unemployment rates are generally below 15% in most developing country cities, but wage rates are depressed in the formal sector, and many are self-employed in the informal sector. Although often maligned, the informal sector is not just a chaotic jumble of unproductive activities. On the contrary, it is an increasingly critical part of national and local productive structures. The very nature of poor countries' participation in globalized economic competition dictates the reduction of socially protected formal sector activities and increases their dependence on less stable but more flexible production structures.

The Kampala study (UG4) which, as previously mentioned, is growing at more than 5% per year, found that migrants "cannot be absorbed by the narrow formal sector as most of them are untrained, untrainable and illiterate." Owing to land shortages and economic stagnation, a return to the rural areas is inconceivable for most. So, migrants find jobs in the informal sector cottage industries (woodworking, auto repair, metal working, transport services) or are self-employed in street hawking and trade, urban agriculture, or waste recycling and reuse. Some fall into illegal activities such as drug trafficking, robbery, pick-pocketing, and prostitution.

The Accra study (GH1 study) confirms the high rates of informal sector employment of 50% or more found by others in African cities (Hinrichson 2002). In one slum area, Nima, 54% were self-employed, and in another, Maamobi, the rate was 50%. Roughly 30% of the economically active adults in both neighbourhoods were employed by the public sector, but no one was employed by the private sector. In Accra as a whole, 65% of the population works in the informal sector.

One of the difficulties for city administrations is that many informal enterprises do not pay taxes and are difficult to regulate. Despite these concerns, it would be wrong to paint too bleak a picture of the informal sector. Studies reviewed by Montgomery et al. show that the boundary between the informal and formal sectors is fairly fluid, with many workers participating in both, and some formal workers using their savings to launch into self-employment. Indeed, were it not for the informal sector, there would be little if any economic vitality in most least developed country urban areas. Even rapidly developing economies such as that in Hô Chi Minh City, Vietnam, have significant levels of informal sector employment of around 12% of the workforce.

3.3. Peri-urban development and land speculation

The growth of cities in the developing world is dynamic, diverse and disordered – and increasingly space-intensive. A recent study commissioned by the World Bank shows that average urban densities (that is, the number of inhabitants per square kilometre of built-up area) have been declining at an annual rate of 1.7 per cent over the last decade in developing countries (Angel et al, 2005). This disordered and leapfrog process of urban expansion, which takes place largely in non-contiguous transitional zones between countryside and city, is increasingly being referred to as "peri-urbanization" (Allen, 2003). It defies easy characterization or quantification.

Peri-urban areas put agricultural land to mixed economic uses. This ranges from farming and animal husbandry to the installation of globalized firms that are looking for large tracts of land in order to install production processes that benefit from economies of scale. Improved communications and transportation networks make these outlying areas increasingly accessible to such concerns. Cheaper infrastructure, land and labour also encourage the de-concentration of more traditional firms who can no longer find space in city centres (Tacoli 1999).

Peri urban areas are also a critical site for settlement of the poor. Because of high rents in the centrally located urban core, the urban poor, low income residents and new migrants are by default pushed to the peripheries. For example, in the case of VN5 study, most newcomers to the city settle in peri-urban areas where land and jobs are more plentiful. Peri-urbanization also transforms rural dwellers into urbanites without changing their place of residence. For example, villages on the fringes of Kampala have increasingly been incorporated into the urban agglomeration and integrated into the urban economy through provision of goods and services to the core. Such settlements generally lack infrastructure and services and their residents can be easily displaced by other economic or residential uses.

Peri-urban areas fulfil many other functions for cities, ranging from the supply of energy, water and building materials to the provision of ecological services such as wildlife corridors, microclimates, buffer areas against flooding and sinks for waste disposal. Social and ecological systems are often incapable of the rapid and complex readjustment that this requires.

4. The Environment

The relationship between population and the environment in developing country cities ranges from local environmental health concerns to issues of regional or global concern – such as habitat loss, changes to the hydrological cycle, urban consumption "footprints" on distant areas, and greenhouse emissions from transportation and industry. Although the latter are undeniably important, we will focus only on health issues here, since they are a more frequent focus of the PRIPODE studies.

A worrying sign in recent years is that urban areas, which since the early 20th century have been characterized by improved public health relative to rural areas, increasingly have pockets of poverty so deep that the health metrics in those areas are sometimes worse than those in poor rural areas (Montgomery et al. 2003, Brockerhoff and Brennan 1997). The primary environmental challenges facing developing country urban areas are provision of adequate water and sanitation; adequate waste removal; slum and

informal settlements in environmentally sensitive or risk-prone areas; and air pollution.[4] We examine each of these in turn.

4.1. Water and sanitation

Lack of access to adequate water and sanitation is, first and foremost, a public health concern. MDG 7, Target 10, aims to "halve by 2015 the proportion of people without sustainable access to safe drinking water and Sanitation." Infant mortality rates in urban areas are significantly lower in homes with piped water (Hinrichsen *et al.* 2002).

The PRIPODE studies confirm the severity of the situation. In a study of child (aged 0-5) diarrhoea prevalence in two medium-sized Cameroonian cities, Ebolowa in the south and Maroua in the north, researchers found prevalence rates of 13% in the former and 24% in the latter, compared to a national rate of 16%. In Maroua, only 6.5% of households had modern toilets, versus 18.4% in Ebolowa, though a slightly higher proportion had access to improved latrines (68.3% vs. 58.7%). The proportion of children with diarrhoea increased in direct relationship to the quality of toilet facilities. Perhaps reflecting source water quality, the semi-arid Maroua diarrhoea had prevalence rates of 19% for internal tap water and 24-25% for public taps and wells, whereas in Ebolowa it was roughly half these levels. Treatment of water reduced prevalence by 62%. Demographic factors – such as the education level of the parents – are intimately associated with diarrhoea prevalence, presumably reflecting an income/amenity effect as well as a personal hygiene effect.

In the Brazzaville study (CG1), the researchers found that 85% of households report have access to tap water, but because of the unreliability of the public water supply, households also depend on rainwater, wells, water services, and the river (in descending order from 30 to 10%). The study found that 35% of respondents reported a case of typhoid in the household in the past 12 months. The researchers attribute this to the poor state of the public water service, which employs neither water testing nor treatment before delivering water to households. Malaria was the most widespread illness,

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[4] Additional mechanisms through which the urban environment may influence health and which are not covered here include the built environment, access to green space, and urban climate as well as social factors. See Galea and Vlahov (2005)

with 96% of households reporting a case; this very high rate is attributable in part to poor drainage and environmental sanitation.

The VN5 study finds that industrial and agricultural wastes and runoff, especially heavy metals and agro-chemicals, are polluting streams and aquifers. Contamination is particularly acute near industrial facilities. Because of regular flooding (56% of households in the districts studied had experience flooding), contaminants mix with flood waters to produce severe environmental health problems. The study of Kampala finds that inadequate evacuation of solid wastes from disposal areas create leachates that are washed into water sources. As a result, 90% of protected springs have been declared unfit for human consumption, yet the population continues to drink the water for lack of alternatives.

4.2. Waste disposal

Functioning solid waste disposal systems are generally lacking in low income country cities, which contributes to the spread of infectious diseases. The lack of adequate waste removal can be attributed to rapid growth of new settlements, reductions in public sector spending associated with SAPs, and budgetary constraints. Waste removal also varies by neighbourhood, with the poorest neighbourhoods generally reporting the greatest problems with inadequate or non-existent waste removal, reflecting the general patterns of social segregation described in Section 4.3 below.

The Brazzaville CG1 study found that 38% of households reported some kind of trash collection (either public or private), whereas 36% threw their trash out in "natural areas" and 24% burned or buried their trash. The Cameroon PRIPODE study found a high proportion of residents disposed of waste by depositing them in pits outside their compounds or by burning. They found little relationship between the type of trash removal and diarrhoea prevalence.

In a survey conducted for the Accra study (GH1), residents of the two slums, Nima and Maamobi, reported the lack of proper solid waste disposal as the biggest environmental risk. Poor drainage and clogged gutters ran a close second, which is also the result of improper waste disposal. A high percentage of residents in these slums favoured the provision of rubbish containers and regular trash collection.

In the Lagos study (NG1), a survey of residents in four Local Government Areas (LGAs) representing different income and population density levels

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found that about 8% of the respondents' claimed that the dump sites in their areas of abode were never evacuated, and almost 46% said that they made private arrangements to evacuate the dumps in their areas. Interviews with local government chairmen suggested that they understood that it was their responsibility to evacuate refuse, but that it required the assistance of the federal government and also local cooperation. Particularly they cited a need for behavioural changes by new migrants who, either because of poverty or practices brought with them from their places of origin, were used to dumping wastes at their backyards.

Of the PRIPODE studies, the Kampala study provides the most detail on the problems of waste disposal and solid waste management. According to the report, Kampala generates an estimated 30,000 metric tons of waste per month, close to three-quarters of which is organic matter, with the remaining proportions split among paper 5.4%, sawdust 1.7%, plastic 1.6%, metals 3.1%, glass and porcelain 0.9%, and miscellaneous 5.5%. In the late 1980s the city had a total of 3,400 dumpsters in selected locations throughout the city, but this was by 1995 reduced to 470. Waste tends to accumulate around dumping sites, creating public health hazards as well as water pollution (described above). The volume of waste has far outstripped the ability of natural sinks and municipal authorities to dispose of them in a safe and efficient manner. Failure of the public collection system has resulted in residents using unconventional methods of disposal such as pits within the backyards, burning, collection in plastic bags and dumping in water courses or on vacant lots. This blocks water drainage channels and streams and contributes to flooding in the low lying areas during the rainy season, unpleasant odours and loss of ecological services.

4.3. Slum and informal settlements

The increasing social segregation of housing in low-income countries has resulted in the dramatic growth of slums, the entrenchment of poverty, the concentration of violence and social problems, and growing environmental health problems (Perlman & Sheehan 2007). Given high rents in city centers and rapidly developing peri-urban areas, the resident poor and new migrants to the city have little alternative but to rent rooms in slum neighbourhoods or to construct shanties in hazard-prone areas: i.e., on steep slopes (such as in Rio de Janeiro and Caracas), flood prone areas (such as parts of Kampala and Lagos), in low elevation coastal zones (such as Mumbai), and in industrial zones handling hazardous materials (such as Bhopal).

The Accra study (GH1) examined health levels across the city, with a focus on two poor neighbourhoods: Nima and Maamobi. Through a survey the researchers ascertained that 14% and 80% of respondents (Nima & Maamobi, respectively) complained of flooding, and 88% and 91% complained of environmental health pollution. When it comes to city-wide assessment of slums, the results are somewhat ambiguous: according to the authors, many of the worst slums in Accra also have the poorest health levels, but some do not. Weeks *et al.* (2006), in related research, found that infant mortality rates vary significantly by ethnic group in Accra, with people of the Ga tribe having highest mortality rates because they tend to live in the most impoverished parts of the city, places where one-room dwellings and poor infrastructure predominate. As Utzinger and Keiser (2006) point out, such heterogeneity in urban contexts is quite common, and is illustrated by the prevalence of malaria.

The Kampala study (UG4) found that informal settlements are rapidly encroaching on wetlands, which has significant public health consequences owing to flooding and reduces the overall capacity of the city to absorb and purify runoff from hill areas. Between 1991 and 2002, swamps were reduced from 20.6% to 1.9% of the land cover of the Kampala administrative area, and lowland forests also changed form 7.6% to 0.4%. This change implies loss of swamp forests to land uses including industrial and residential developments.

4.4. Air pollution

Urban air pollution is a function of a number of factors, most notably transport-related emissions from the growing fleets of cars, trucks and buses, as well as industrial emissions and waste burning. In a 2003 PERN cyberseminar,[5] Cohen reported that considerable uncertainties exist in the estimates of the portion of the global burden of disease attributable to air pollution. Cohen estimates that outdoor air pollution (fine particulate matter smaller than 2.5 microns, PM2.5) is currently responsible for about 0.80 million (1.2% of world total) premature deaths and 6.4 million (0.5% of world total) years of life lost (YLL) in the populations of the world's cities with more than100,000 people. The estimates were subject to considerable uncertainty,

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[5] Population-Environment Research Network cyberseminar on Air Pollution and Health Linkages, 1-15 December 2003.

due largely to the lack of air pollution measurements and information about the shape of concentration-response functions in developing countries.

Other health impacts include contamination of food, either due to lead uptake in urban agricultural plots or food preparation in polluted areas. The Lagos study (NG1) found that street food prepared in the poorest slum areas had far higher contaminant levels of lead, cadmium, and zinc owing in part to air pollution contamination than street food prepared in more affluent neighbourhoods.

Air pollution can have regional impacts, especially through the transport of ground-level photo-chemical smog or ozone. This can reduce crop yields and affect forest growth. Air pollution may also be a factor in migration decisions. It was cited in a study of migrants who left Mexico City for secondary cities in Mexico as an important factor in their decisions to leave the capital (Izazola 2003).

5. Policy Implications: Moving Towards Solutions

Here we look at policy implications of the research described in previous sections. We start out by looking at the big picture of population stabilization, then look at other issues such as the sustainable use of space and meeting the needs of the urban poor.

5.1. The "big picture" of population stabilization and its limitations

Population-environment linkages have received an enormous amount of attention from scholars, policymakers and the general public over the last few decades. Most of this has focused on whether, and to what extent, population growth is responsible for the aggravation of environmental problems. As noted in Section II, the unprecedented scale of ongoing urbanization is linked to large and rapidly growing populations. Typically, such discussions have prompted outcries that the population bomb needs to be defused through aggressive fertility control. Such simplistic solutions overlook the inertia of demographic processes, overstate the ability of family planning programs to reduce fertility rapidly, and neglect the role of development in population environment interactions. Moreover, they detract attention from the other important ways in which population dynamics influence environmental change.

Population has grown rapidly in developing countries, especially over the last half century. But this is due to mortality decline, not to fertility conditions. Moreover, fertility has recently declined significantly in most regions of the world. The practical ability to "deal with the population problem" through population control and/or "family planning" programs is largely overestimated. Without some significant form of social transformation, modernization or "development", it is highly unlikely that fertility can be forcefully reduced. Secondly, even with a drastic reduction in the current fertility rate, population size will continue to grow rapidly for some time in countries that have recently experienced high fertility levels. At the present time, almost 60% of all population growth at the world level is attributable to inertial factors (i.e. due to population composition stemming from patterns of growth in previous eras, rather than to current fertility and mortality patterns).

Both population and environmental outcomes are linked to development trajectories that need to be understood within their particular historical contexts. The critical framework which enfolds them all at this time is economic globalization, wherein all countries are feverishly trying to emulate the production and consumption patterns of the world's main polluters. Ultimately, population control in the absence of some measure of development or social transformation is not likely to work from a demographic standpoint. Without drastic changes in the production and consumption patterns of both developed and developing countries – a sustainability transition – even rapid population stabilization will not avert major environmental problems.

5.2. The sustainable use of space

As the focus on population growth per se diminishes in importance, spatial distribution, and within that, unprecedented urban spatial growth, assumes increasing significance in the environmental agenda of the 21st century. Indeed, it can be argued that, today, the most pertinent PDE relations are space-specific. Where the resident population of a given territorial area actually lives, on what type of land, with what forms of occupation, in what ecological conditions, whether it is concentrated or dispersed, all this makes a great difference in terms of sustainability. Nevertheless, these aspects have received relatively little attention to this moment.

For much of the last century environmentalists took a dim view of urbanization and city growth. But the recent turnaround among environmental scholars concerning the value of urban areas for global and local environ-

mental outcomes is rather remarkable. It is increasingly recognized that urban localities actually offer better chances for long-term sustainability, starting with the fact that they concentrate half the Earth's population on less than three per cent of its land area. The dispersion of population and economic activities would likely make the problems worse rather than better. Adopting the right approaches in anticipation of urban growth can also prevent many of the environmental problems linked to urbanization. Density is potentially useful. With world population at 6.6 billion people in 2007 and growing at over 75 million a year, demographic concentration gives sustainability a better chance. The protection of rural ecosystems ultimately requires that population be concentrated in non-primary sector activities and densely populated areas (Martine 2006).

In this light, it has been suggested that instead of trying to figure out the theoretical carrying capacity of the Earth, we could profitably focus on a more practical issue, namely, how can an existing population make the most sustainable use of a given territory, in light of available resources, population, economic potential and the current development context? (See Martine 2001) What is the best way that this concrete population can be distributed over its territory, currently and into the future, so that it will cause the least possible environmental damage and best promote sustainability, while also making the best possible use of its comparative advantages (and thus attaining the highest tolerable levels of economic growth and social development)? These are not easy questions to answer, yet they open up an area that holds much promise and that is ripe for policy intervention.

5.3. Planning for the needs of the poor

A crucial fact that is often overlooked in discussions of the ongoing urban transformation is that the upcoming massive growth of urban population will be largely composed of poor people (Garau et al. 2005). As discussed in Section 2.1., urban growth stems largely from natural increase and rural to urban migration. In developing countries, the poor generally constitute the largest proportion of migrants. Poor people also tend to make the greatest contribution to natural increase in the cities because of the relative size of this population group and because they have higher fertility levels.

Hence, planning realistically for future urban growth means, first and foremost, planning for the needs of the poor. The current size of New York, Los Angeles, and Ottawa, may be comparable to that of Mumbai, Manila and Kampala, respectively. Yet, planning for the future of the latter three devel-

oping country cities requires a totally different paradigm, one that has an overarching concern with the needs of the poor at its core. It will also require more creative approaches, given the low level of resources available to local governments in most developing countries.

Improved governance – responding effectively to local needs in a participatory, transparent and accountable manner – will require an adequate understanding of the nature of the problems and good local information. The above discussion has highlighted some of the main problems and also some of the key misconceptions that have plagued planning efforts. Improved governance will also require that, while responding to current needs, those in charge turn a prospective eye to inevitable future growth. The trends towards massive increases in urban population, particularly in smaller and intermediate cities, will continue (see Section 6). The short-term mandate of most policymakers favours attempts to resolve short-term problems without concern for the medium and longer-term future. Such an approach explains why so many master plans in developing country cities are outdated by the time their implementation begins.

The Millennium Project Slums Task Force (Garau *et al.* 2005) lists a number of proposals to target the problem of urban poverty. They suggest community participation, including working with local communities to upgrade slum areas. They also describe processes that would decrease socioeconomic segregation by acknowledging poor people's "right to the city." A key issue is security of tenure and bringing an end to evictions, as well as providing adequate water and sanitation services, and access to public transportation. Although the task seems daunting, the financial resources required to provide basic services is surprisingly little – on the order of $294 billion by 2020.

6. Conclusion: Planning for inevitable urban growth

Theoretically, urban areas present considerable advantages in economic, social, demographic and environmental terms. In a globalized economy, cities are better able to take advantage of emerging opportunities and thus better able than rural areas to improve the social or health situation for large numbers of people. Urbanization may help to retard rural environmental degradation, by serving as an outlet for rural migration. Urbanization also promotes the empowerment of women, while changing aspirations and lifestyles that accelerate fertility decline.

Despite these real advantages, poverty and environmental degradation are growing faster in urban areas and many least developed countries are struggling mightily to cope with rapid urban growth. The disparity between principle and practice can be attributed, to an important extent, to the difficulties being encountered by developing countries, and especially in Sub-Saharan Africa, to participate effectively in global markets. However, many of the difficulties faced by cities in developing countries can be traced to urban mismanagement.

A more effective approach would require, at the outset, a more proactive and positive attitude towards urban growth. Urban policymakers are increasingly set against urban growth and also fail to anticipate inevitable future growth. In this scenario, one can only expect a deterioration of existing conditions. Politicians and planners have to accept the reality of inevitable growth and learn to work with local community organizations and other Organizations of the Urban Poor (OUPs) to plan ahead for their social and environmental future.

Providing land and shelter for the poor ahead of the curve is critical; trying to help them after they have invaded inadequate lands is socially, economically and environmentally costly. Helping to orient future urban growth in directions that will be least harmful to the environment, and planning infrastructure needs ahead of time can save thousand of lives and billions of dollars. Bringing together the different politico-administrative units that are affected by peri-urbanization into some sort of regional entity and convoking the different social actors to participate in deliberations regarding the future of this area can help to head off some of its most negative outcomes. All this requires looking ahead.[6]

This paper has sought to situate the PRIPODE-sponsored studies in the context of the broader literature on urban population-development-environment linkages. Of the five cities examined, the only city with potentially bright prospects for broad increases in levels of wellbeing may be Hô Chi Minh, if only because its economic dynamism could provide sufficient resources to improve the city's infrastructure and environmental management. However, even this city faces many daunting challenges, particularly in regards to environmental pollution. Also, its low lying position places it at acute risk

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[6] A recent publication by UNFPA (State of the World Population 2007: Unleashing the Potential of Urban Growth" deals with many of the key issues involved in taking a more effective proactive approach.

of sea-level rise (McGranahan et al. 2007). It seems apparent that urgent actions will need to be taken in the areas of urban governance and planning if human wellbeing, health and environmental amenities are to increase in all five cities.

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List of PRIPODE's Teams

Code	Country	Principal investigator	Research programme
BF5	Burkina Faso	OUATTARA Ardjouma	• Mobilité spatiale de la population : nécessité de développement et risques de dégradation de l'environnement dans l'Est et le Sud-Ouest du Burkina.
CG1	Congo	DEFOUNDOUX Hyacinthe	• Brazzaville, pauvreté et problèmes environnementaux.
CM1	Cameroon	NGWE Emmanuel	• Les déterminants socio-environnementaux de la morbidité diarrhéique des enfants de moins de 5 ans en milieu urbain camerounais : les villes de Ebolowa et Maroua.
DO1	Dominican Rep.	MEYRELES Lourdes	• Environmental degradation, disaster risk construction and vulnerability in the Caribbean.
DZ1	Algeria	SPIGA Sassia	• Circulations migratoires transsahariennes et développement urbain au Sahara Central.
GH1	Ghana	ANARFI John K.	• Population, development and environment in metropolitan Accra: a two-phase study.
LA1	Laos	THONGMANIVONG Sithong	• Study on dynamic resource use and land cover transition in Northern Laos.
MA2	Morocco	CHAREF Mohamed	• Interaction entre migrations internationales, croissance urbaine et développement durable au Maroc.
MG2	Madagascar	RAKOTONDRAFARA Charles	• Perception de l'environnement et attitudes des paysans malgaches face aux projets de développement rural.
ML2	Mali	CISSE Ibrahima	• Croissance démographique, développement de la culture du coton, et gestion durable des ressources naturelles en zone Mali-Sud.
NE1	Niger	BANOIN Maxime	• Quelles transitions agraires en zones semi-arides à forte croissance démographique : le cas du Niger.
NG1	Nigeria	OKUNEYE Peter Adebola	• Rural-Urban migration, poverty and sustainable environment: the case of Nigeria.

Code	Country	Principal investigator	Research programme
NG2	Nigeria	OLOMOLA Aderibigbe	• Population dynamics, real sector development and environmental consequences: a comparative analysis of the Nigerian agricultural and industrial sector.
PL8	Palestine	JAD E. Issac	• Policy tools towards sustainable land use and urban environmental management at municipal level under a transitional political context-the case of Bethlehem district, Palestine.
TG4	Togo	VIGNIKIN Kokou	• Peuplement, mobilité et développement dans un milieu défavorisé : le cas de la région des savanes au Togo.
UG1	Uganda	MUWANGA James	• Population, development and environment linkage at farm level in Uganda.
UG4	Uganda	NYAKAANA Jockey Baker	• Urban Development, Population and the Environment in Uganda. The Case of Kampala and its Environ.
VN5	Vietnam	Le Van Thanh	• Développement économique, urbanisation et changements de l'environnement à Hô Chi Minh Ville, Vietnam : interrelations et politiques publiques.
VN6	Vietnam	DAO Thê-Tuân	• Développement économique et problèmes de l'environnement au Vietnam dans un contexte de forte pression démographique.
ZA1	South Africa	TWINE Wayne	• Household characteristics in rural South Africa: implications for natural resources and development.