# Population, Urbanization, Environment, and Security: A Summary of the Issues

*by Ellen M. Brennan*

**Abstract:** To understand the critical linkages between urbanization, public health and habitat, the environment, population growth, and international security, this article highlights the trends in urban growth, particularly in the developing world, and their potential to affect the international community. Issues addressed include migration to urban centers, the immediate environmental and health impacts of urban pollution on developing country cities, and the link between crime and security.

## INTRODUCTION

In the latter half of the twentieth century, megacities have been on the rise and future projections for the twenty-first century show an increase in population growth in developing countries' urban centers, with potential catastrophic effects at the international level. To understand the critical linkages between urbanization, public health and habitat, the environment, population growth, and international security, this article highlights the trends in urban growth, particularly in the developing world, and their potential to affect the international community. Issues addressed include migration to the urban centers, the immediate environmental and health impacts of urban pollution on developing country cities, and the link between crime and security.

According to the United Nations Population Division, the world will pass the historical six billion mark in October 1999. Recently, the United Nations issued long-range projections to 2150. According to the medium-fertility ("most likely") scenario, world population will stabilize at slightly under 11 billion persons around 2200.

One of the most striking features of world population growth is the rising predominance of the developing world. Currently, 81 million persons are added annually to the world's population—95 percent of them in developing countries. According to the United Nations' long-range projections, the population of Africa will nearly quadruple—from 700 million persons in 1995 to 2.8 billion in 2150. Significant growth is also projected for Asia. China is projected to grow from 1.2 to 1.6 billion inhabitants. India, increasing from 900 million to 1.7 billion, will surpass China to become the world's largest country. The rest of Asia is projected to grow from 1.3 to 2.8 billion. Latin America is projected to increase from 477 to 916 million, whereas Northern America (Canada and the United States combined) will increase from 297 to 414 million. Europe is the only major geographical area whose population is projected to decline—from 728 million in 1995 to 595 million in 2150 (United Nations, 1998a).

The second striking feature is related to urban growth. Although the growth of world urban population has been slower than projected twenty years ago, it has nevertheless been unprecedented. In 1950, less than 30 percent of the world's population consisted of urban dwellers. In a few years, roughly around 2006, a crossroads will be reached in human history when half of the world's population will be residing in urban areas. Between 1995 and 2030, the world's urban population is projected to double—from 2.6 to 5.1 billion, by which time three-fifths of the world's population will be living in urban areas (United Nations, 1998b).

As in the case of total population, there will be a significant redistribution of world urban population between the developed and the developing regions. Between 1950 and 1975, 32 million new urban dwellers were added annually worldwide—about two-thirds in the developing countries. Currently, 59 million new urban dwellers are added annually—89 percent in developing countries. By 2025-2030, 76 million will be added annually—98 percent in developing countries.

Looking at the regional breakdown, Africa has the lowest level of urbanization and the fastest urban growth. Currently, a

*Ellen M. Brennan is Chief of the Population Policy Section of the United Nations Population Division. She is also on the Committee on Population at the National Academy of Sciences. This article was prepared for the Woodrow Wilson Center's Comparitive Urban Studies Project's conference entitled "The 21ˢᵗ Century Urban Agenda: Urbanization, Population, Environment, and Security" and was published as no. 22 in the Comparitive Urban Studies' Occasional Paper Series. Visit http://wwics.si.edu/THEMES/URBAN/CUSPWEB1.HTM for other papers in the series.*

little more than one third of Africans are urban dwellers; by 2030, the proportion will be a little more than half. The problem facing much of Africa is that such rapid rates of urban growth make it exceedingly difficult to provide services. The urban growth rate for Africa as a whole currently is around 4.4 percent. East Africa is growing at 5.6 percent per annum and West Africa at 5.1 percent, with individual countries growing at even higher rates. Projections show that the growth rate for Africa as a whole will stay above four percent through 2005 and above three percent until 2020-2025.

The region of Latin America and the Caribbean is the most urbanized region in the developing world. Between 1995 and 2030, 249 million people will be added to the urban population of this region, bringing the percentage of people living in cities to 83 percent. Asia has a level of urbanization similar to that of Africa—a little more than one third in 1995. Asia as a whole, however, will have to absorb huge population increments—a total of 1.5 billion new urban inhabitants by 2030. South Asia faces particularly daunting prospects, with India having to absorb as many as 385 million new urban inhabitants between 1995 and 2030, Pakistan 113 million, and Bangladesh 55

million (United Nations, 1998b).

A central characteristic of current world urbanization trends is that megacities—cities with populations of ten million or more—are becoming larger and more numerous, accounting for an increasing proportion of urban dwellers. At the same time, more than half of the world's population continues to live in cities with fewer than 500,000 inhabitants. Currently, there are 14 cities in the world with over ten million inhabitants, ten in developing countries. By 2015, there will be 26 cities with over ten million inhabitants—22 in developing countries (18 in Asia, four in Latin America, two in Africa) (Table 1). These megacities will shelter 418 million inhabitants (10.6 percent of world urban population). By 2015, there will be 38 cities of five to ten million inhabitants, representing 6.7 percent of world urban population. There will be 463 cities (three-quarters in developing countries) of one to five million inhabitants—representing nearly a quarter (23.6 percent) of world urban population. Between 1950 and 1995, it is interesting to note that the percentage of population worldwide residing in the 407 cities of 500,000 to one million inhabitants, remained nearly constant—at around nine percent, both in

## Table 1

| Urban agglomeration and Country | Population (thousands) | | |
| --- | --- | --- | --- |
| | 1975 | 1995 | 20 |
| **Less developed regions:** | | | |
| Beijing, China | 8545 | 11299 | 15 |
| Bombay, India | 6856 | 15138 | 26 |
| Buenos Aires, Argentina | 9144 | 11802 | 13 |
| Cairo, Egypt | 6079 | 9690 | 14 |
| Calcutta, India | 7888 | 11923 | 17 |
| Delhi, India | 4426 | 9948 | 16 |
| Dhaka, Bangladesh | 1925 | 8545 | 19 |
| Hangzhou, China | 1097 | 4207 | 11 |
| Hyderabad, India | 2086 | 5477 | 10 |
| Istanbul, Turkey | 3601 | 7911 | 12 |
| Jakarta, Indonesia | 4814 | 8621 | 13 |
| Karachi, Pakistan | 3983 | 9733 | 19 |
| Lagos, Nigeria | 3300 | 10287 | 24 |
| Lahore, Pakistan | 2399 | 5012 | 10 |
| Metro Manila, Philippines | 5000 | 9286 | 14 |
| Mexico City, Mexico | 11236 | 16562 | 19 |
| Rio de Janeiro, Brazil | 7854 | 10181 | 11 |
| São Paulo, Brazil | 10047 | 16533 | 20 |
| Seoul, Republic of Korea | 6808 | 11609 | 12 |
| Shanghai, China | 11443 | 13584 | 17 |
| Tehran, Iran (Islamic Rep. of) | 4274 | 6836 | 10 |
| Tianjin, China | 6160 | 9415 | 13 |
| **More developed regions:** | | | |
| Los Angeles, USA | 8926 | 12410 | 14 |
| New York, USA | 15880 | 16332 | 17 |
| Osaka, Japan | 9844 | 10609 | 10 |

developing and developed countries. The same is true for cities with fewer than 500,000 inhabitants. Although they have remained relatively stable with regard to population growth, secondary cities are nevertheless critical. Around half of the urban population in both the developing and developed world live in cities of fewer than 500,000 inhabitants (United Nations, 1998b).

The emergence of megacities is a modern phenomenon, occurring over the last half century. In 1950, only New York had a population of ten million or more. In addition to the increase in their number, megacities are becoming considerably larger. The minimum population size for a city to make the list of the world's 15 largest urban agglomerations was 3.3 million in 1950. By 1995, a population of 9.9 million was required as the threshold. Projections for the year 2000 show Dhaka, with 11 million inhabitants, as the fifteenth largest urban agglomeration; by 2015, Los Angeles, with 14.2 million, is expected to be fifteenth on the list (United Nations, 1998b).

Whereas the average annual rate of population growth was one percent or less for megacities in the developed world during 1970-1990, megacities in developing countries have exhibited significantly higher rates of population growth, as well as a larger range of rates, than those in developed countries. Some megacities are continuing to grow very rapidly. Dhaka, for example, grew by 7.6 percent per annum between 1970 and 1990, implying a doubling time of only nine years, while Lagos grew by 6.7 percent, implying a doubling time of a little more than ten years (United Nations, 1995a).

Contrary to the alarmist predictions about "exploding cities," the growth of most of the world's megacities has been slowing down, in some instances quite dramatically. Mexico City is a case in point. Whereas projections prepared by the United Nations and the World Bank in the 1970s forecast a population for Mexico City in the range of 27-30 million in the year 2000, Mexico City's population in 1995 was 16.6 million—projected to reach 18.1 million in the year 2000 and 19.2 million in 2015 (United Nations, 1998b). One explanation for the decline in megacity growth rates appears to be a deceleration in rates of national population growth. According to Chen and Heligman (1994), a simple regression indicates that the national population growth rate explains 47 percent of the variation in megacity growth rates in developing countries. Of course, the fact that India's six megacities grew at rates of between two and 4.5 percent per annum during 1970-1990 indicates that other forces must surely be involved. Still, the relationship between megacity and national population growth rates is quite remarkable, given that megacities generally comprise only a very small proportion of their national populations (Chen and Heligman, 1994).

It is difficult to generalize about the factors behind the slowdown in the growth of many of the world's megacities, as numerous complex factors are involved. Again, Mexico City provides an example. In addition to voluntary emigration after the 1985 earthquake, factors making Mexico City less attractive have included rising housing prices, the increasing cost of living, and quality of life considerations (Brambila Paz, 1998). Indeed, one third of a sample of Mexico City residents interviewed in a migration survey conducted in 1987 (CONAPO, Encuesta Nacional de Migración en Areas Urbanas) indicated that they expected to move away from the city in the future; more than 75 percent of the residents sampled referred to problems related to metropolitan life, such as delinquency, stress, and air pollution. Of even greater importance is the fact that more dynamic growth has occurred elsewhere. Indeed, the rapid economic growth of Mexico's border states—which accounted for 62 percent of national job growth from 1985 to 1990 and "without which national economic growth would have been anemic" (Richardson, 1993b) is a major explanation for Mexico City's relative decline.

For purposes of analysis, the remainder of this article will focus on environmental and security issues in the world's megacities. This focus is not to ignore the fact that cities further down the urban hierarchy often have equally or even more severe service deficits and environmental problems with relatively fewer resources available to tackle the problems. Instead it is done to narrow and simplify the analysis

## REGIONAL OVERVIEW

There is a great diversity of experience among the world's megacities. Broad differences in patterns of megacity growth persist among the major geographical regions. In Latin America, 78 percent of the population lived in urban areas in 1995 (a proportion comparable to that of the developed countries). The rate of population growth of most major cities in the region peaked during the 1960s, when fertility levels were still relatively high and governments in the region were pursuing policies of import-substituting industrialization that drew large numbers of migrants to the cities.

In recent years, a dramatic and unanticipated slowdown in the growth of megacities in the Latin American region surprised even local observers. Whereas a process of intra-metropolitan employment dispersal has been taking place for a number of years in such cities as Buenos Aires, São Paulo, and Mexico City, the scale has increased greatly. Manufacturing plants have been moving much greater distances and often beyond metropolitan boundaries within a 200 km radius from the central core of São Paulo for example (Gilbert 1993). In addition, profound changes have taken place over the past decade in Buenos Aires, Mexico City, Rio de Janeiro, São Paulo, and other large Latin American cities as a result of economic recession and structural adjustment programs.

Despite its relatively low level of urbanization (34.6 percent in 1995), Asia accounts for 46 percent of world urban population. Amounting to 1.2 billion persons, this number is higher than the current urban population of the developed world (Chen, Valente, and Zlotnick, 1998). In the future, a majority of the world's megacities will be located in Asia. Indeed, in 2015 Asia will be home to 18 megacities, increasing its share from 50 percent in 1995 to 69 percent (United Nations, 1998b). Many megacities in Asia have experienced dramatic economic growth in recent years. Seoul, with a gross domestic product (GDP) of US $93 billion in 1990—the twelfth highest in the world (Prud'homme, 1994)—is rapidly moving away

from "developing" country status. Until the Asian economic crisis in 1998, Bangkok and Jakarta had booming economies. In the Southeast Asian countries as a whole, urbanization has been penetrating deep into the countryside, resulting in extended and dispersed mega-urban regions encompassing hinterlands as far as 100 km from the central core (McGee, 1995).

In recent years, China's megacities have been growing at very rapid rates, although this growth is partly due to reclassification. Goldstein (1993) cautions that the meaning of "urban" in China is now far different from the generally accepted meaning of that term. The use of official urban and migration statistics to measure levels of and changes in urbanization can be seriously misleading. Moreover, the experience of China's megacities has been fairly unique. Urban migration over the past several decades has been closely related to political swings, economic changes, and related policy shifts.

The megacities of the Indian subcontinent (e.g. Bangalore, Bombay, Calcutta, Delhi, Hyderabad, and Madras in India; Karachi and Lahore in Pakistan; and Dhaka in Bangladesh) have followed a different pattern. More similar to the African experience, urban growth is fueled less by economic dynamism than by rural poverty and continuing high fertility. Many megacities on the subcontinent have fairly stagnant economies, yet they will have to absorb huge population increments over the next several decades. Bombay, where at least half the population does not have access to adequate shelter, is projected to have a population of 26.2 million in 2015. Karachi, a city experiencing continuing political unrest, is projected to have a population of 19.4 million inhabitants. Dhaka, one of the poorest cities in the world where the average annual income for slum dwellers currently is around US $150, is projected to have a population of 19.5 million in 2015 (United Nations, 1998b).

Fueled by continuing out-migration from impoverished rural areas and by very high natural increase, despite years of sustained recession, cities in Africa are growing very rapidly. At nearly twice the world average, this growth puts incredible pressure on already strained economies. Whereas much of the academic literature stresses the strong link between economic development and urbanization, the relationship between the two is much weaker in Africa than elsewhere in the developing world. Many countries in the region experienced negative rates of gross national product (GNP) growth in the last two decades, whereas others grew very slowly. Yet, almost all countries in the region exhibited high urban growth rates, including those with negative GNP growth. The two megacities in sub-Saharan Africa, Lagos, and Kinshasa, are among the world's poorest yet most rapidly growing megacities and are expected to continue to grow at a similar pace over the next two decades.

## Patterns of Intrametropolitan Population Growth

Just as there are widely divergent patterns of economic development and urban growth among the major geographical regions, there are striking demographic differentials within megacities. Aggregate rates of population growth for the megacities may be quite misleading. Megacities are spatially very extensive, with sizes ranging from the traditional core city of 100-200 sq. km to regions of 2,000-10,000 sq. km and more (Hamer, 1994).

Population growth in large cities usually does not increase the population density of high-density areas, but promotes densification of less developed areas and expansion at the urban fringe. In particular, population densities in the central core frequently decline as households are displaced by the expansion of other activities. As Ingram (1998) notes, this finding is very robust in both industrial and developing countries and has been observed in cities as diverse as Bangkok, Bogotá, Mexico City, Shanghai, and Tokyo. Whereas the traditional urban cores of many megacities are experiencing very slow or negative population growth, areas on the periphery typically are experiencing rapid growth. For example, the city of São Paulo grew by one percent per annum during 1980-1991. The central core as well as the interior and intermediate rings lost population (at rates of -1.3, -0.9, and -0.4 percent per annum, respectively). The exterior ring grew by only 0.4 percent per annum while the periphery expanded by 3 percent (Rolnik, Kowarik, and Somekh, 1990).

In many megacities, periurban areas have grown or are continuing to grow at staggering rates, making it impossible to provide services. In São Paulo, for example, the growth of the peripheral ring was nearly 13 percent per annum during 1960-1970, declining to 7.4 percent during 1970-1980 and to 3.8 percent during 1980-1987. It is not uncommon for peripheral areas of megacities to be growing by rates of 10-20 percent per annum. However, because of the rapidity of growth in these newly developing areas, sometimes as a result of sudden land invasions, the magnitude of this growth is unrecorded.

Such rapid population growth in periurban areas has serious implications for infrastructure provision and land markets. A major reason why local administrations in many developing country cities have not coped successfully with urban population growth is that they simply do not know what is going on in their local land markets. Most megacities lack sufficient, accurate, and current data on patterns of land conversion, infrastructure deployment patterns, and land subdivision patterns. Frequently, urban maps are 20 to 30 years old and lack any description of entire sections of cities, and particularly of the burgeoning periurban areas (Dowall, 1995). Clearly, the typical ten-year census interval is a problem in the analysis of megacities, as the metropolitan population might easily grow by more than two million within a five-year period (Richardson, 1993a).

## The Components of Megacity Growth

Even if all in-migration to the megacities were somehow to cease, cities will have to absorb huge population increments as a result of natural increase. This point is often lost in the popular literature. In many megacities, natural increase is and will continue to be the most important factor explaining population growth. At the world level, net migration from rural to urban areas accounts for less than half of the population growth of cities. Around 60 percent of urban growth is due to

the excess of urban fertility over urban mortality.

A study of the components of urban growth prepared by the United Nations Population Division found that whereas internal migration and reclassification was the source of 64 percent of urban growth in developing Asia during the 1980s (around 50 percent if China is excluded), it accounted for only 25 percent of urban growth in Africa and 34 percent in Latin America (Chen, Valente, and Zlotnick, 1998). These findings have important implications for policymakers and planners. In regions characterized by economic stagnation, where rates of rural out-migration have declined over the past decade, such as Africa and Latin America, the contribution of natural increase has been strengthened. Consequently, if the growth of urban areas is to be significantly reduced, more emphasis needs to be given to the reduction of fertility.

Interestingly, for all of the theorizing about the linkages between urbanization and fertility decline over the past several decades, detailed work in this area has been quite sketchy. Using Demographic and Health Survey (DHS) data collected between 1987 and 1993 in 14 African countries, recent research on fertility behavior in African cities has found that high levels of female in-migration have reduced total fertility rates in African cities by about one birth per woman (Brockerhoff, 1996). This influence of migration on fertility appears consistent throughout sub-Saharan Africa, suggesting that migration to cities may be promoting national fertility transitions in Africa. This situation is all the more ironic since most African governments currently are quite serious about reducing aggregate rates of population growth. Yet they are quite insistent on curbing the growth of metropolitan areas, mainly by retaining population in the countryside.

In a sense, the richness of this research highlights how little has been known up to now about the complex factors involved in recent urban fertility behavior in developing countries. Factors such as the volume and permanence of migration, the effects of age structure, spousal separation, exposure to modern ideas, and the changing opportunity costs of childbearing remain understudied. Despite the widespread acknowledgment 20 years ago that family planning was one of the most cost effective means of reducing urban growth, virtually no work has been done on family planning use and needs among the urban poor. Indeed, from a policy perspective, the limited knowledge of the linkages between rural-urban migration and, in particular, contraceptive behavior has hampered the efforts of policymakers and program workers to design and implement effective family planning programs which might have a significant impact on reducing urban growth (Brockerhoff, 1996).

## ATTEMPTS TO CONTROL MEGACITY GROWTH

While a considerable knowledge gap remains regarding the complexity and future implications of demographic change in the world's megacities, there is a generally accepted body of ideas in the policy arena for controlling megacity growth. For example, the anti-urban bias finally appears to have dissipated. It is now widely acknowledged that cities are, in general, productive places that make more than a proportionate contribution to economic growth. In retrospect, it is perhaps astonishing that the antiurban bias of planners, some scholars, and government officials has continued for so long despite apparent grounds for discrediting it. For years, planners made futile attempts to "contain" urban growth on the assumption that rural to urban migration could be stopped or slowed down and that people could be relocated from the existing urban areas. These views no longer are accepted widely, except perhaps in Africa.

Early attempts to "contain" megacity growth ranged from the "closed city" policies of Jakarta (1970) and Manila (1960s), which were notorious failures, to China's household registration system. It was long assumed that direct controls on residential mobility had little chance of success, except perhaps in a collectivist society such as China; even this turned out not to be the case. Despite decades of restrictions, China's "floating population" in its largest cities now numbers in the millions.

A number of developing countries have devoted considerable efforts to devising strategies to reduce metropolitan growth, primarily by fostering the growth of secondary cities and promoting regional development. Mexico is a prime example. Since the early 1970s, Mexico has had one elaborate plan after another—typically a new one in each six-year presidential term of office. It is generally acknowledged, however, that these plans have had minimal impact on influencing Mexico's patterns of spatial distribution (Brambila Paz, 1998).

The great paradox is that profound changes have occurred in patterns of spatial distribution in Mexico and in other developing countries. Yet regional policy is considered to have contributed very little to it. Indeed, as Gilbert (1993) notes, deconcentration has occurred in practice when regional planning has been at its weakest, with few governments in heavily indebted developing countries having any funds to invest in infrastructure in the poorer regions, or to offer incentives to industrialists to locate to the periphery.

It is now widely acknowledged that it is counterproductive to talk about how to "control" the growth of megacities, whether through coercive measures or channeling growth to secondary cities. Moreover, despite the rhetoric which still abounds, megacity size per se is not a critical policy variable. Since the 1980s, there has been a remarkable shift of research attention from the demography of cities to the polity of cities, with particular focus on issues of urban management and, in the 1990s, urban governance (Stren, 1995). With respect to management, a virtual consensus has emerged among urban scholars that the costs and benefits of cities are not merely a product of population size (hence growth), but are primarily a consequence of the commitment and capabilities of municipal governments to implement policies that improve population welfare. The assumption that good management overcomes population constraints of cities would appear tenable based on recent history. Many cities of the world, for instance those of recent origin in sub-Saharan Africa, are too big relative to their managerial capacities. Yet some of these "oversized" cities are quite small, e.g., in the range of 100,000 to 200,000 inhabitants (Brockerhoff and Brennan, 1998). Similarly, many

megacities—Tokyo is cited most often—are seemingly well managed and, therefore, not too large.

## ENVIRONMENTAL ISSUES

Megacities throughout the developing world are experiencing tremendous environmental stress. Quantification of the extent of pollution in specific megacities is difficult, because monitoring stations are rare or non-existent. Nevertheless, it is widely recognized that environmental degradation in many of the world's megacities is becoming worse. Given this fact, it is ironic that the greatest attention—even at international fora such as UNCED (the United Nations Conference on Environment and Development, Rio de Janeiro, 1992)—has been paid to issues of managing the "global commons" rather than to the critical "brown issues," such as polluted air, filthy water, and inadequate sanitation that affect hundreds of millions of the world's urban inhabitants. It is even more ironic that this distortion is sometimes reproduced within developing countries. Some national environmental groups become active in saving endangered species, but give little attention to the acute public health hazards and problems of environmental pollution facing their own citizens (Hardoy and Satterthwaite, 1989).

The sheer magnitude of population growth is an important variable affecting urban environmental problems because it directly affects the spatial concentration of people, industry, commerce, vehicles, energy consumption, water use, waste generation, and other environmental stresses (Bartone, Bernstein, and Leitmann, 1992). The environmental impact of city size is generally considered negative. The larger the city, it is assumed, the greater the per capita environmental costs or damages. However, as Prud'homme (1994) cautions, a number of caveats are in order. Since what ultimately counts is not so much pollution discharged, but rather pollution discharged minus pollution eliminated, it is important to note that for a number of pollutants (e.g. solid waste, water pollution), there are economies of scale in pollution abatement. Also, large cities are generally resource-saving relative to smaller cities; they are usually denser; they lend themselves better to public transportation usage and include a larger share of apartment buildings, hence they consume less land and less energy per capita. Finally, because transportation flows increase with population dispersion, environmental damages associated with transportation presumably could be reduced by increased concentration in a few large cities. As Prud'homme concludes, the relationships between city size, or city size distributions on the one hand, and environmental damages on the other hand, are numerous, complex, and very poorly known (1994).

There is not necessarily a strong direct linkage between the rate of urban growth and environmental problems. As noted, over the past several decades, the growth rates of many of the world's megacities have slowed considerably. Yet urban environmental problems clearly have worsened. One central problem is that economic development exacerbates many environmental problems (e.g. solid waste, automotive pollution) because the quantity of urban wastes generated per capita also tends to increase steadily with increased per capita income. Overall, the relationships between urbanization and environmental degradation are very complex, involving interactions with the natural and the built environment, as well as various economic, political, and social factors. The regional ecosystem in which a megacity is located, for example, is often a critical determinant of the severity of environmental conditions as well as the complexity of potential intervention strategies (Bartone, Bernstein, and Leitmann, 1992).

Contamination of water supplies in megacities of the developing world comes from many sources: discharge of untreated industrial wastes into watercourses; leaching of liquids from industrial or municipal waste dumps into surface or ground water; inadequate treatment of municipal sewage; and hazardous and toxic materials flushed into watercourses during storms because of poor solid waste management. Most developing countries do not have the resources either to detect many modern chemicals or to establish facilities or sites to treat hazardous wastes (Kalbermatten and Middleton, 1991). However, the impact of fecal contamination of water resources is one of the most crucial water quality issues. In highly industrialized countries, the transition from traditional to modern types of environmental pollution took place over one hundred years or more. The developing countries are faced increasingly with situations where more advanced pollution issues appear before control over traditional pollution sources has been successfully achieved (Bartone, 1989). In effect, residents of the developing world's megacities have the worst of both the traditional and modern world, with a wide spectrum of pollution problems, ranging from human excreta to hazardous manmade chemicals.

Most rivers and canals in developing country megacities are literally large open sewers, with the organic wastes from industries, drains, sewers, and urban runoff rapidly depleting the dissolved oxygen. In many Asian cities, rivers flow into the cities already laden with nutrients (nitrogen and phosphorus), pathogens, sediment, and pesticide residues from the watershed. In flowing through the city, water becomes increasingly polluted with sewage, industrial effluents, and in some cases solid waste. In Delhi, for example, the coliform count (mostly from fecal contamination) is 7,500 per 100 ml when the Yamuna River enters Delhi, and a stunning 24 million per 100 ml when the Yamuna leaves the city. That stretch of the Yamuna also receives about 20 million liters of industrial effluents, including 500,000 liters of DDT wastes per day (Hardoy, Mitlin, and Satterthwaite, 1992).

Sanitation is a major problem affecting water quality. As cities become more densely populated, the per-household volumes of wastewater exceed the infiltration capacity of local soils and require greater drainage capacity and the introduction of sewer systems. Most municipally provided sanitation systems are based on conventional sewer systems. Coverage is generally poor, with the proportion of the metropolitan population served by piped sewerage being less than 20 percent in Dhaka, Karachi, and Manila, 30 percent in Delhi, 40 percent in Jakarta, and 45 percent in Calcutta (Brennan, 1993). Sewers are generally in poor condition, and sewage treatment plants discharge effluents

that are little better than raw sewage. Because sanitation is a service that depends for its effectiveness on a high level of consistent and reliable coverage, providing service only to a select minority, or service that is intermittent, does not produce the anticipated public health and environmental benefits (Kalbermatten and Middleton, 1991).

Megacities are being inundated in their own wastes as a result of inadequate waste management policies and practices. Uncontrolled, unsegregated dumping of municipal solid waste, hazardous/industrial wastes, and clinical/medical wastes at the same sites in periurban areas and near squatter settlements increases the risk of injury and exposure to other health hazards. In most megacities in developing countries, solid waste management costs consume from 20 to 50 percent of local government expenditures (Cointreau-Levine, 1994). Only 50 to 70 percent of urban residents receive services, however, and most disposal is by unsafe open dumping.

Throughout the developing world, the problem of air pollution arises from the fact that emissions from vehicles, industrial boilers, and domestic heating sources exceed the capacity of cities' natural ventilation systems to disperse and dilute these emissions to nonharmful exposure levels (Bartone, 1989). Of the major sources of air pollution in the world's megacities, sulfur dioxide comes chiefly from emissions from oil burned in power generation and industrial plants; suspended particulate matter comes mainly from domestic fires, power, and industrial plants; carbon monoxide and nitrogen dioxide come mainly from the gasoline fumes of motor vehicles; and ozone is formed by the action of sunlight on the smog from vehicle emissions (WHO and UNEP, 1992). Ambient lead is almost exclusively generated by motor vehicles burning leaded gasoline, except in China, where it also originates from the very large amounts of coal that are burned.

Automotive air pollution in the developing countries is largely an urban phenomenon confined to the very large cities. In many megacities, atmospheric pollutants commonly associated with motor vehicles often exceed World Health Organization guidelines (WHO and UNEP, 1992). WHO recommends, for example, that human beings should not be exposed to ozone concentrations of >0.1ppm for more than one hour per year and that ozone levels not be exceeded for more than 30 days per year. The population of Mexico City (which has half of Mexico's total vehicle fleet) was exposed to more than 1,400 hours of high ozone concentrations during 145 days in 1991 (Pendakur, 1992). The situation was equally bad in two other Latin American megacities, São Paulo (which has a quarter of Brazil's vehicle fleet) and Santiago. Although the Asian cities do reasonably well in terms of ozone levels, many of them greatly exceed WHO standards for suspended particulate matter and sulfur dioxide; five cities exceeded these thresholds in 1991: Bombay, 100 days; Beijing, 272 days; Jakarta, 173 days; Calcutta, 268 days; and Delhi, 294 days (Pendakur, 1992). The situation is also quite serious in Lagos, Cairo, and Teheran (Faiz, 1992).

Although automotive lead emissions have declined sharply in most developed countries, they are generally rising in the developing countries. Moreover, shares of automotive sulfur dioxide, and particulate and lead emissions are likely to be significantly higher in the future because of the high rate of motorization in many of the world's megacities, the more extensive use of diesel-powered vehicles, and the poorer quality of automotive fuel (Faiz, 1992).

## ENVIRONMENTAL IMPACTS ON HEALTH

Having briefly examined a number of macro environmental problems (e.g. water and air pollution citywide), it is important to address the issue of environmental impacts on the health of megacity residents. Compared to the complex linkages among the environment, city size, and rates of urban growth, the linkages between environmental degradation and health are more straightforward. In most cases, the poorer residents of the world's megacities bear the human costs of the most debilitating impacts of environmental degradation. In many megacities, environmental pollution affects the poor more severely in part because many of them live at the periphery where manufacturing, processing, and distilling plants are often built. The periphery is also where environmental protection is frequently the weakest.

In recent years, there has been a growing body of literature on the linkages among the urban environment, poverty, and health. A 1992 review, for example, identified over one hundred studies concerned with relative environmental health impacts of urbanization (Bradley, Stephens, Harpham, and Cairncross, 1992). A notable aspect of many of these studies is the focus on differentials in health status or mortality rates between various population groups within cities. Not surprisingly, many of the studies found conditions in poorer areas of cities to be much worse than in the more affluent areas or even than the city average. Infant mortality rates in poorer areas, for example, were often four or more times higher than in more affluent areas, with much larger differentials apparent in the poorest district as compared to the most affluent district. Large differentials between rich and poor districts were also common in the incidence of many environmentally related diseases (e.g. tuberculosis and typhoid [Satterthwaite, 1993]).

Whereas a majority of the studies to date on environment and health have focused on infant mortality, only a few systematic studies examine urban chronic disease or adult health (this is true of developing countries generally and is not confined to urban groups). Indeed, as Stephens (1994: 9) notes, "when one opens the Pandora's box of adult as well as child health in cities, the linkages of urban environment, poverty, and health become overwhelmingly complex; the physical conditions of urban poverty seem to act with economic circumstances to compound threats to health." Evidence suggests that, internationally and at the city level, the complexity of urban poverty and its health consequences have not been taken seriously enough either in our analyses or agenda setting (Cohen, 1992). This is perhaps linked to a continued search for single solutions to an increasingly complex problem: "it could be argued that tackling the sanitary health of the urban populations in developing countries today is, in the long term, the least of our challenges; history tells us that the insults of urban poverty

do not go away with such interventions" (Stephens, 1994: 21).

## Psychosocial Health

Psychosocial diseases and trauma (e.g. violence in young adults, depression, drug and alcohol abuse, suicide, and interpersonal violence, including child and spousal abuse) have received increasing attention from researchers and policymakers in recent years. As in the case of physical health, there is a growing literature on differentials in mental health within cities which has found a higher prevalence of mental illness in low income, physically deteriorated areas in a wide variety of settings (Bradley et. al., 1992). As Stephens (1994) notes, the complex roots of psychosocial disease in urban environments are deep within the poverty-environment nexus and are common to the poor of both developed and developing countries. However, the precise linkages between different elements of the physical environment and psychosocial disorder or disease are difficult to ascertain and to separate from other variables. Moreover, care must be taken not to overstate the effects of environmental factors on psychosocial health when more fundamental social, economic, and political factors (such as low and very unstable incomes and oppression or discrimination), underlie psychosocial disorders (Satterthwaite, 1993).

Trauma and particularly violence are increasing problems of the social environment of cities that relate to psychosocial health. They are articulated as a major concern of the urban poor (and rich) in a growing number of cities. In public health terms, deaths from violence now overshadow infectious diseases as child killers in some poor urban environments (Stephens, 1994). Violence (mostly homicides), for example, now account for 86 percent of all deaths in boys aged 15-19 in São Paulo and over half of all deaths in 5-14 year olds (SEMPLA, 1992).

> São Paulo has tackled its less complicated urban poverty questions—its basic infrastructure questions—with comparative success. But the urban poverty has not gone away; education and income differentials still exist in severity, with a seven-fold differential existing between best and worst zones. This is perhaps reflected in the health data—infectious diseases have gone largely from the favelas of São Paulo, but they have been replaced ferociously by an epidemic of violence— rates of mortality are the second highest internationally (after the US) and it appears that the children saved from sanitary diseases have grown up to kill each other (Stephens, 1994: 15).

## Crime and Security

Crime and public security in the world's large cities have been receiving increasing attention from many quarters in recent years. Crime challenges the very foundations of the social order, takes a heavy toll in terms of human suffering, and results in economic waste and a general deterioration in the quality of life.

In recent years, massive public protests and riots in cities such as Delhi, Jakarta, Karachi, and a number of African cities, have resulted in significant loss of life and widespread destruction of property. These disturbances have at times been triggered by immediate economic circumstances (e.g. rising food prices, food scarcity, currency devaluation) or by political upheavals. In some cases, simmering ethnic and communal tensions (e.g. between Hindus and Sikhs in Delhi, Mohajirs and Pathans in Karachi, and Indonesians and ethnic Chinese in Jakarta) have come to the surface during such episodes, resulting in an even higher toll of death and destruction. Such episodes of citywide violence have serious potential for destabilizing worldwide financial markets and destroying infrastructure, thereby impacting already fragile national economies, or igniting violence in entire geographical regions.

Worldwide, however, urban crime is dominated by crimes against property (e.g. theft, burglary, car hijacking), which account for at least half of all offenses in the world's cities (United Nations Centre for Human Settlements, 1996). During the early 1990s, 61 percent of the population in urban areas of over 100,000 inhabitants at world level were victims of crime over a five-year period; in the developing regions, 68 percent of the urban population in Latin America, 44 percent in Asia and 76 percent in Africa were crime victims. Violent crime, including murder, assault, rape and sexual abuse, and domestic violence, now accounts for 25 to 30 percent of offenses in cities in developing countries. One notable aspect of violent crime is the increase in murders. In several of the world's largest cities, including Los Angeles, Rio de Janeiro, Bogotá, and São Paulo, more than 2,000 people are murdered each year. In Rio de Janeiro, more than 6,000 people were murdered in 1990 alone, resulting in a murder rate of 60 per 100,000 inhabitants; as a point of comparison, the murder rate in Washington, D.C. was over 70 per 100,000 in the early 1990s (United Nations Centre for Human Settlements, 1996).

The increase in crime has generated a feeling of insecurity, transforming the spatial forms of many cities. The result has often been the geographical and social segregation of the wealthy from the poor. In some cities, insecurity and fear are changing the city's landscape and patterns of daily life, including people's movements and the use of public transport, sometimes discouraging people from using the streets and public spaces altogether (United Nations Centre for Human Settlements, 1996). In many of the world's megacities, the poor are the main victims of urban violence, including crimes against property and violent crimes such as rape or assault. The poor cannot afford burglar alarms and other protection devices and have no access to private security services. At the same time, these services are becoming a burgeoning worldwide industry: as of the mid-1980s, there were 127 security companies in operation in Bogotá (with five times more privately paid guards than regular policemen) and 80 security firms in Nairobi; likewise, 94 percent of automobiles in Bangkok were fitted with security devices (Buendia, 1989).

Urban crime and violence in the world's large cities is generally not a spontaneous occurrence, but rather the product of inequality and social exclusion. Although rapid urbanization

and poverty partly explain the scale and extent of urban violence and crime, other factors such as the political and economic climate, local traditions and values, and the degree of social cohesion and solidarity among urban communities also play a role. Erosion of moral values and the collapse of social structure and institutions, such as the family or the neighborhood, put communities more at risk of urban violence and crime (Habitat Debate, 1998).

Urban violence is also deeply embedded in the specific local context. Among the world's large cities, there are sharply different degrees of social welfare development and income distribution patterns, contrasting demographic patterns (e.g. in terms of population growth, internal and international migration flows, age structure), varying cultural factors (e.g. religion, ethnicity), and differing paces of cultural change.

There is considerable debate about the relative importance of different factors. Many specialists stress the significance of inadequate incomes. These disparities are usually combined with very poor and overcrowded housing and living conditions, and often insecure tenure. Together the situation presents fertile ground for the development of violence (United Nations Centre for Human Settlements, 1996). Other explanations focus on the contemporary urban environment, particularly the ostentatious display of wealth and luxury goods in certain areas. These displays engender an attitude that legitimizes the "distribution of wealth" through criminal activity (United Nations Centre for Human Settlements, 1996). Indeed, in a simple "Robin Hood" model of income redistribution developed by a World Bank economist, inequality variables seem to play a significant role, particularly in the case of property crimes (Bourguignon 1998). Little is known about how crime varies with business cycles; a study of Lagos in the early 1980s found that fraudulent offenses appeared to occur only in times of economic prosperity, while robbery occurred during periods of both prosperity and depression. However, violent crimes tended to diminish when a new government or economic recovery signaled hope of political or social improvement and stability (Buendia, 1989).

In many cities there has been a greater susceptibility to the negative outcomes of mass culture owing to the weakening of social bonds and controls. Satellite dishes, linking individual homes to a remote outside world, are a new feature of the urban landscape in much of the developing world. The level of violence on television and in other media is thought to play a significant role in engendering violence in the United States; clearly, little is known about the future impact of exporting this material to the furthest reaches of the developing world. The easy availability of guns is a factor in some societies. In many acts of violence, such as rape, alcohol is often a stimulating factor. Another factor in the increase in murder and violent crime in many cities has been the growth in drug trafficking, which has reached unprecedented levels and has diverted considerable police personnel from other tasks. At the neighborhood level, petty drug dealing has become a relatively profitable activity in many megacities.

## THE MISSING LINK

When considering the linkages between urbanization, environment, and security, clearly, the missing link is poverty. In coming decades, increasing numbers of cities in the developing world will be extremely large, will have a high proportion of their population living in poverty, and will suffer from severe environmental degradation. The poor in these cities will suffer disproportionately from waterborne and sanitation-related diseases as well as from psychosocial diseases and violent crime. Occasionally, disease outbreaks in developing country cities will result in worldwide epidemics such as cholera. More frequently, however, poor environmental conditions will mainly affect the health and productivity of low-income megacity residents. Likewise, citywide violence will sometimes have worldwide reverberations, raising concerns for regional stability and affecting financial markets. More frequently, however, urban crime will consist of the poor preying upon the poor.

Why should these issues be addressed? The major reason is one of basic human rights. Many of the world's largest cities will house millions and millions of people living in conditions of abject poverty. Given current economic realities, the situation of most of these people is unlikely to improve substantially in coming decades. Providing minimal environmental sanitation and health care services and basic public security may be all that can be realistically provided. As the Programme of Action of the International Conference on Population and Development emphasized:

> Governments should increase the capacity and competence of city and municipal authorities…to safeguard the environment, to respond to the need of all citizens, including urban squatters, for personal safety, basic infrastructure and services, to eliminate health and social problems, including problems of drugs and criminality, and problems resulting from overcrowding and disasters, and to provide people with alternatives to living in areas prone to natural and man-made disasters. (United Nations, 1995b: 49)

A second reason for addressing these urban issues relates to globalization. In coming decades, large cities will be at the forefront of globalization and will be the principal nodes generating and mediating the flows of capital, people, trade, greenhouse gases, pollutants, diseases, and information. If both urbanization and decentralization continue in the decades ahead, cities will carry a heavy charge of responsibility for political stability, openness, economic progress, and the quality of life in many nations.

Megacities that can become and remain more competitive in international trade and investment are likely to grow in the future, whereas those than cannot are likely to stagnate or decline. This economic arena is another area where environmental issues and crime and security come into play. Growing congestion and pollution in the main urban centers make it increasingly difficult for some countries to compete for foreign direct investment. Moreover, violence and crime not

only affects tourism—frequently a major foreign exchange earner—but also adversely impacts foreign investment.

The necessity for megacities to be internationally competitive in order to sustain their economic vitality in the twenty-first century may well create new and wide economic chasms if governments in cities with lagging internal competitiveness do not improve urban conditions (Rondinelli and Vastag, 1998). Megacities that continue to grow in terms of population, but lag behind in international competitiveness and economic development may become less able to support large influxes of population or alleviate urban poverty.

It is important to emphasize that the population of the world's megacities will continue to grow over the next several decades, whether or not they become more internationally competitive—indeed, whether or not their economies grow at all (Rondinelli and Vastag, 1998). Economically lagging metropolitan areas in developing countries continue to attract migrants because the "push factors" of rural poverty make even subsistence living in poor cities a more attractive alternative. Indeed, among the megacities with the highest rates of population growth are poor cities with sluggish economies such as Cairo, Calcutta, Dhaka, Kinshasa, Lagos, and Madras.

How the world's megacities are managed in coming decades will shape patterns of national economic growth, the settlement of vast populations, and the social and political stability of many developing countries. The stakes are high. Without extraordinary efforts to develop urban economies, especially in such critical areas as infrastructure, a segregated world economy may emerge where, those megacities that have the necessary prerequisites for integration prosper, while others, fall farther and farther behind. Unless such trends are reversed, the urban landscape in many developing countries will be bleak, chaotic, and impoverished.

### References

Bartone, Carl R. 1989. "Urban Management and the Environment in Developing Country Cities: Priorities for Action." Paper presented at the Meeting on Cities, the Mainspring of Economic Development in Developing Countries, Lille, France, 6-10 November.

Bartone, Carl R., Janis Bernstein, and Josef Leitmann. 1992. "Managing the Environmental Challenge of Mega-Urban Regions." Paper prepared for the International Conference on Managing the Mega-Urban Regions of ASEAN Countries: Policy Challenges and Responses. Bangkok: Asian Institute of Technology, 30 November-3 December.

Bilsborrow, Richard E. (ed.) 1996. *Migration, Urbanization, and Development: New Directions and Issues.* Norwell, MA: United Nations Population Fund and Kluwer Academic Publishers.

Bourguignon, François. 1998. "Inefficient inequalities: notes on the crime connection." Paper prepared for the Summer Workshop on Challenges for the 21st Century. Washington, DC: The World Bank, 6-9 July.

Bradley, David, Carolyn Stephens, Trudy Harpham, and Sandy Cairncross. 1992. *A Review of Environmental Health Impacts in Developing Country Cities.* Washington, DC: The World Bank, Urban Management Program.

Brambila Paz, Carlos. 1998. "A Reassessment of Migration and Urbanization in Mexico in the 20th Century," In Richard E. Bilsborrow (ed.), *Migration, Urbanization, and Development: New Directions and Issues.* Norwell, MA: United Nations Population Fund and Kluwer Academic Publishers.

Brennan, Ellen. 1993. "Air/Water Pollution Issues in the Megacities," In Shridath Ramphal and Steven W. Sinding (eds.), *Population Growth and Environmental Issues.* New York: The Rene Dubos Center for Human Environments.

Brockerhoff, Martin. 1996. "Migration and the Fertility Transition in African Cities," In Richard E. Bilsborrow (ed.), *Migration, Urbanization, and Development: New Directions and Issues.* Norwell, MA: United Nations Population Fund and Kluwer Academic Publishers.

Brockerhoff, Martin, and Ellen Brennan. 1998. "The Poverty of Cities in Developing Regions." *Population and Development Review* 24, No. 1. (March).

Buendia, Hernando Gomez. 1989. *Urban Crime: Global Trends and Policies.* Tokyo: The United Nations University.

Chen, Nancy Yu-ping, and Larry Heligman. 1994. "Growth of the World's Megalopolises," In Roland J. Fuchs et al. (eds.), *Megacity Growth and the Future.* Tokyo: United Nations University Press.

Chen, Nancy Yu-Ping, Paolo Valente, and Hania Zlotnick. 1998. "What Do We Know about Recent Trends in Urbanization?" In Richard E. Bilsborrow (ed.), *Migration, Urbanization, and Development: New Directions and Issues.* Norwell, MA: United Nations Population Fund and Kluwer Academic Publishers.

Cohen, Michael. 1992. "The New Agendas: Urban Policy and Urban Development," In M. Harris (ed.), *Cities in the 1990s: The Challenge for Developing Countries.* London: UCL Press.

Cointreau-Levine, Sandra. 1994. "Private Sector Participation in Municipal Solid Waste Services in Developing Countries." Vol. I, *The Formal Sector.* Washington, DC: UNDP/UNCHS/World Bank Urban Management Programme.

Consejo Nacional de Población (CONAPO). 1992. "Características principales de la migración en las grandes ciudades del país. Resultados preliminares de la Encuesta Nacional de Migracíon en Areas Urbanas." Mexico City: CONAPO.

Dowall, David E. 1995. "The Land Market Assessment. A New Tool for Urban Management." UNDP/UNCHS/World Bank Urban Management Programme.

Faiz, Asif. 1992. "Motor Vehicle Emissions in Developing Countries: Relative Implications for Urban Air Quality," In Alcira Kreimer and Mohan Munasinghe (eds.), *Environmental Management and Urban Vulnerability.* Washington, DC: The World Bank.

Fuchs, Roland J., Ellen Brennan, Chamie, Fu-Chen Lo, and Juha I. Uho (eds.). 1994. *Megacity Growth and the Future.* Tokyo: United Nations University Press.

Gilbert, Alan. 1993. "Third World Cities: The Changing National Settlement System." *Urban Studies* 30, Nos. 4/5, pp. 721-40.

Goldstein, Sidney. 1993. "The Impact of Temporary Migration on Urban Places: Thailand and China as Case Studies," In John D. Kasarda and Allan M. Parnell (eds.), *Third World Cities: Problems, Policies and Prospects.* Newbury Park, CA: Sage Publications.

*Habitat Debate.* The United Nations Centre for Human Settlements, Vol. 4, No. 1, March 1998. Nairobi, Kenya.

Hamer, Andrew. 1994. "Economic Impacts of Third World Megacities: Is Size the Issue?" In Roland Fuchs, et al. (eds.), *Megacity Growth and the Future.* Tokyo: United Nations University Press.

Hardoy, Jorge E., and David E. Satterthwaite. 1989. *Squatter Citizen.* London: Earthscan Publications.

Hardoy, Jorge E., Diana Mitlin, and David Satterthwaite. 1992. *Environmental Problems in Third World Cities.* London: Earthscan Publications.

Ingram, Gregory K. 1998. "Patterns of Metropolitan Development: What Have We Learned?" *Urban Studies* 35, No. 7, pp. 1019-35.

Kalbermatten, J.M., and R.M. Middleton. 1991. "Future Directions in Water Supply and Waste Disposal." Unpublished paper. Washington, DC: Kalbermatten Associates, Inc.

Kasarda, John D., and Allan M. Parnell, eds. 1993. *Third World Cities: Problems, Policies and Prospects.* Newbury Park, CA: Sage Publications.

McGee, T.G. 1995. "Metrofitting the Emerging Mega-urban Regions of ASEAN: An Overview," In T.G. McGee and Ira M. Robinson (eds.), *The Mega-Urban Regions of Southeast Asia.* Vancouver: University of British Columbia Press.

McGee, T.G., and Ira M. Robinson. 1995. *The Mega-Urban Regions of Southeast Asia.* Vancouver: University of British Columbia Press.

Pendakur, V. Setty. 1992. "The End of the Road—Congestion, Management and Sustainable Development." Paper prepared for the 13th Pacific Asian Congress of Municipalities, Calgary, Canada, 19-23 July.

Prud'homme, Remy. 1994. "On the Economic Role of Cities." Paper prepared for the Conference on Cities and the New Global Economy, Government of Australia and the OECD, Melbourne, Australia, 20-23 November.

Richardson, Harry W. 1993a. "Efficiency and Welfare in LDC Megacities." In John D. Kasarda and Allan M. Parnell (eds.), *Third World Cities: Problems, Policies and Prospects.* Newbury Park, CA: Sage Publications.

_____. 1993b. "NAFTA and Urban Mexico." Paper presented at the conference on Sistemas Metropolitanas: nuevos enfoques y prospectivas. Toluca, Mexico: El Colegio Mexiquense.

Rolnik, Raquel, Lucio Kowarik, and Nadia Somekh. 1990. *São Paulo: Crise e Mudança.* São Paulo: Editorial Brasiliense, S.A.

Rondinelli, Dennis, and Gyula Vastag. 1998. "Urban Growth in the 21st Century: Assessing the International Competitiveness of Metropolitan Areas." In Richard E. Bilsborrow (ed.), *Migration, Urbanization, and Development: New Directions and Issues.* Norwell, MA: United Nations Population Fund and Kluwer Academic Publishers.

Satterthwaite, David. 1993. "The Impact on Health of Urban Environments." *Environment and Urbanization* 5, No. 2, October.

SEMPLA. 1992. *Base de Dados para o Planejamento.* São Paulo: SEMPLA.

Stephens, Carolyn. 1994. "Health, Poverty, and the Environment: The Nexus." Paper presented at the Second Annual World Bank Conference on Environmentally Sustainable Development: The Human Face of the Urban Environment. Washington, DC, 19-21 September.

Stren, Richard. 1995. *Perspectives on the City.* Volume 4. Toronto: University of Toronto, Centre for Urban and Community Studies.

United Nations. 1995a. *World Urbanization Prospects: The 1994 Revision.* New York: United Nations.

United Nations. 1995b. *Population and Development: Programme of Action Adopted at the International Conference on Population and Development, Cairo, 5-13 September, 1994.* New York: United Nations.

United Nations Centre for Human Settlements (UNCHS). 1996. *An Urbanizing World: Global Report on Human Settlements.* Oxford: Oxford University Press.

United Nations Secretariat. 1998a. *World Population Projections to 2150.* New York: United Nations Department of Economic and Social Affairs, Population Division.

_____. 1998b. *World Urbanization Prospects: The 1996 Revision.* New York: United Nations Department of Economic and Social Affairs, Population Division.

World Health Organization and the United Nations Environment Programme. 1992. *Urban Air Pollution in Megacities of the World.* Oxford: Blackwell Publishers.