URBAN CENTERS: An Assessment of Sustainability

Gordon McGranahan and David Satterthwaite

International Institute for Environment and Development, London WC1H ODD, United Kingdom; email: Gordon.Mcgranahan@iied.org, David.Satterthwaite@iied.org

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■ **Abstract** As increasing proportions of the world's population, production, and consumption become concentrated in urban areas, the need for urban development patterns that are more ecologically sustainable becomes obvious. A large proportion of the world's urban population also has needs that are unmet. We review the scale and nature of urban change worldwide, the environmental impacts of these changes, and the potentials and the difficulties in better meeting sustainable development goals in urban centers. The discussion of the interaction between city-based production and consumption and the resources and sinks on which these rely that are outside city boundaries is a reminder that the goal is not sustainable cities but cities that contribute to sustainable development within their boundaries, in the region around them, and globally.

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INTRODUCTION

At its core, the concept of sustainable development is about reconciling "development" and "environment." Development, i.e., the meeting of people's needs, requires use of resources and implies generation of wastes. The environment has finite limits to the use of many resources and on the capacity of ecosystems to absorb or breakdown wastes or render them harmless at local, regional, and global scales. If development implies extending to all current and future populations the levels of resource use and waste generation that are the norm among middle-income groups in high-income nations, it is likely to conflict with local or global systems with finite resources and capacities to assimilate wastes. There is good evidence that such conflicts are occurring in more and more localities and also that the richest localities have overcome local constraints by drawing on the resources and sinks of other localities to the point where some resources and ecological processes are threatened both in these localities and globally (1). This implies that sustainable development requires a commitment to ensuring everyone's needs are met with modes of development that are less rooted in high-consumption, high-waste lifestyles.

Urban centers have particular relevance to any discussion of sustainable development for three reasons. The first is an increasingly urbanized world; today close to half the world's population live in urban centers, and the proportion is likely to continue growing as an increasing amount of the world's economic activities concentrate in urban centers (2). As described below, a significant proportion of the world's population with unmet needs lives in urban areas. The second reason is that urban centers concentrate most of the world's economic activities, including most industrial production, and thus are the sites that concentrate most demands for the natural resources used in such production and the sites that generate most industrial wastes. The third is that much of the world's middle- and upper-income groups live and work in urban centers, and it is their demands for goods and services that underpin most of the (rural and urban) resource demands and waste outputs from production worldwide. As a result of urban centers' concentration of middle- and upper-income groups and of the world's nonagricultural production, inevitably they are also the sites for the generation of a high proportion of greenhouse gases. In addition, many of the greenhouse gases generated outside urban centers are linked to urban-based demands—as in the greenhouse gases generated by fossil-fuel power stations, oil wells, and farms that are outside urban boundaries but where the electricity, oil, and farm products are destined for urban producers or consumers. Thus, the quality of environmental management within urban centers, which include measures to increase resource use efficiency and reduce waste generation, heavily influences not only the quality of life for the urban population but also populations that may be far outside of urban areas. As a result, the scale of resource use and waste generation arising from production and consumption located in urban centers has major implications for broad ecological sustainability. Thus, the key ecological issue for urban centers is not sustainable cities but cities and smaller urban centers that have production systems

and inhabitants with patterns of consumption that are compatible with sustainable development within their region (encompassing both rural and urban areas) and globally.

AN URBANIZING WORLD

By 2003, the world's urban population reached 3 billion people, around the same size as the world's total population in 1960 (3). Close to half of the world's population now lives in urban centers, compared to less than 15% in 1900 (4). During the twentieth century, the world's urban population increased more than tenfold, and many aspects of urban change over the last fifty years are unprecedented. These include not only the world's level of urbanization and the size of its urban population but also the number of countries becoming more urbanized and the size and number of very large cities. Many cities have had populations that grew ten to twentyfold in the last 30 years (2). Most of the world's largest cities are now in Asia, not in Europe or North America.

Table 1, with statistics on the scale of urban change in each region between 1950 and 2000, shows that most of the world's urban population is now outside Europe and North America. Asia alone contains almost half the world's urban population, even if more than three fifths of its people still live in rural areas. Africa, which is generally perceived as overwhelmingly rural, now has close to two fifths of its population in urban areas and a larger total urban population than North America. The urban population of Africa, Asia, Latin America, and the Caribbean is now nearly three times the size of the urban population of the rest of the world. United Nations' (U.N.) projections suggest that urban populations are growing so much faster than rural populations that 85% of the growth in the world's population between 2000 and 2010 will be in urban areas, and virtually all of this growth will be in Africa, Asia, and Latin America (3).

Some care is needed in interpreting the urban statistics in Table 1. Aggregate statistics for regions obscure the great diversity in urban trends among nations. Most nations may be urbanizing, but a large proportion of the world's urban centers are not growing rapidly. Many even have more people moving out than in, so they either have declining populations or populations growing below their rate of natural increase. These include many of the world's largest cities (Mexico City, Sao Paulo, Buenos Aires, Kolkata—formerly Calcutta—and Seoul) (2). The increasing number of cities with 10 million or more inhabitants may seem to be a cause for concern, but there are relatively few of them—16 by 2000—and in this year, they concentrated less than 4% of the world's population (2, 3).

The statistics in Table 1 also tell us nothing about the complex and often rapidly changing movements of people in and out of most urban centers. There are no agreed international criteria for how city boundaries should be defined. Many large cities have their population undercounted as suburban settlements have long spilled over the city boundaries. However, for other cities, their population is

TABLE 1   The distribution of the world's urban population by region, 1950–2010

Region	1950	1970	1990	2000[a]	Projection for 2010
Urban population (millions of inhabitants)					
World	751	1357	2286	2862	3514
Africa	32	82	197	295	426
Asia	244	501	1023	1376	1784
Europe	287	424	521	534	536
Latin America and the Caribbean	70	164	313	391	470
Northern America	110	171	213	243	273
Oceania	8	14	19	23	26
Percentage of population living in urban areas					
World	29.8	36.8	43.5	47.2	51.5
Africa	14.7	23.1	31.8	37.2	42.7
Asia	17.4	23.4	32.2	37.5	43.0
Europe	52.4	64.6	72.1	73.4	75.1
Latin America and the Caribbean	41.9	57.6	71.1	75.4	79.0
Northern America	63.9	73.8	75.4	77.4	79.8
Oceania	61.6	71.2	70.8	74.1	75.7
Percentage of the world's urban population living in					
World	100	100	100	100	100
Africa	4.3	6.1	8.6	10.3	12.1
Asia	32.5	37.0	44.8	48.1	50.8
Europe	38.3	31.3	22.8	18.7	15.3
Latin America and the Caribbean	9.3	12.1	13.7	13.7	13.4
Northern America	14.6	12.6	9.3	8.5	7.8
Oceania	1.0	1.0	0.8	0.8	0.8

[a]The statistics for 2000 in this table are an aggregation of national statistics; many of which draw on national censuses held in 1999, 2000, or 2001. But some are based on estimates or projections from statistics drawn from censuses held around 1990. There is also a group of countries (mostly in Africa) for which there are no census data since the 1970s or early 1980s, so all figures for their urban (and rural) populations are based on estimates and projections. The statistics are drawn or derived from (3).

overstated because city boundaries have been redefined to encompass several thousand square kilometers and include large rural populations and populations of separate urban centers. Population statistics also tell us nothing of the very large economic, social, political, and demographic changes that have underpinned the trend toward increasingly urbanized societies. The most important underpinning of urban change during the twentieth century was the large increase in the size of the global economy. In general, the nations with the largest cities and with the most rapid increase in their levels of urbanization are the nations with the largest increases in their economies (2, 5). There is an economic logic underlying the distribution of the world's urban population, which includes its largest cities, as can be seen in the concentration of the world's "million cities" (cities with one million

or more inhabitants) and megacities in its largest economies. In 2000, the world's 5 largest economies (those in the United States, China, Japan, India, and Germany) had 9 of the world's 16 megacities and 46% of its million cities. By 2000, all but 2 of the world's 16 megacities and more than two thirds of its million cities were in the 20 largest economies. Similarly, within each of the world's regions, most of the largest cities are concentrated in the largest economies—for instance, Brazil and Mexico in Latin America and China, India, Indonesia, and the Republic of Korea in Asia (2). However, there are also other important underpinnings of urbanization in many nations. For example, in most African nations, rapid urbanization just before and after achieving independence reflects both the removal of colonial controls on the right of their population to live in urban centers and the building of the institutional base for independent nations.

Taking a long-term view of urban change, it is not surprising that Asia has most of the world's largest cities, because throughout most of history this has been the case. The growing number of large Asian cities reflects the region's growing importance within the world economy. In addition, although rapid urban growth is often seen as a problem, it is generally the nations that have urbanized most in the last 50 years that have the highest average life expectancies or the largest increase in their life expectancies. In addition, the megacities may appear chaotic and out of control, but most have life expectancies and provision for piped water, sanitation, schools, and health care that are well above their national average or the average for smaller urban centers—even if the aggregate statistics for some of the better served megacities hide significant proportions of their population who live in very poor conditions (5–7).

Recent censuses also show that the world today is less dominated by large cities than had been anticipated. For instance, Mexico City had 18 million people in 2000 (8)—not the 31 million people predicted 25 years ago (9). Kolkata (formerly Calcutta) had around 13 million by 2000, not the 40–50 million that had been predicted during the 1970s (10). Sao Paulo, Rio de Janeiro, Seoul, Chennai (formerly Madras), and Cairo are among the many other large cities that, by 2000, had several million inhabitants fewer than had been predicted. In addition, the actual number of megacities with more than 10 million inhabitants in 2000 is fewer than had been expected (2). This is often because smaller cities have successfully attracted new investments away from the very large cities. For instance in southeast Brazil, over the last 20 years, Sao Paulo has lost new investments to a network of smaller cities, which include Porto Alegre and Curitiba, and in Mexico, much new investment has been in cities on or close to the border with the United States and not in Mexico City. In addition, as in Europe and North America, well-managed smaller cities often attract businesses and middle- and upper-income groups away from large cities because of a better quality of life, including a capacity to offer better quality, affordable housing.

The world also proved to have a smaller urban population and to be less urbanized than expected in 2000. By this date, the world's urban population had 270 million people fewer than had been predicted 20 years previously (2). The

main reason for this is the slow economic growth (or economic decline) that many low- and middle-income nations have experienced since 1980. This helps explain slower population growth rates for many cities in Africa and Latin America. Part of this is also related to structural adjustment policies that brought declines in employment, falling real incomes and declining urban welfare, and proved to be less successful than hoped in stimulating economic growth (11). For most nations, urban population growth rates also dropped due to falling fertility rates. For some, it was also because of rising mortality rates. By the late 1990s, this included large and growing levels of mortality from HIV/AIDS. This is particularly apparent in certain sub-Saharan African nations with high levels of infection and the absence of affordable drugs. The illness is reshaping urban trends in many nations (11).

There is an obvious association between the world's largest cities and globalization. Growing cross-border flows of raw materials, goods, information, income, and capital, much of it managed by transnational corporations, underpin a network of what can be termed "global cities" that are the sites for the management and servicing of the global economy (12). Most international investment is concentrated in a relatively small proportion of the world's cities. Many of the world's fastest growing cities are also the cities that have had most success in attracting international investment. The remittance flows created by large-scale international migration associated with globalization have also had a profound impact in cities and smaller urban centers where many migrants come from. The income flows to households in low- or middle-income countries from those working abroad and often supports not only higher consumption levels but also more investment in housing. For many low- and middle-income nations, the total value of remittance flows from migrants working abroad is larger than total aid flows (13).

However, the association between globalization and large cities is moderated by two factors. The first is that advanced telecommunications systems allow a separation of the production process from those who manage and finance it. For example, the economies of London and New York may depend heavily on growing markets for industrial goods, but they have very little such industrial production themselves. The second, linked to this, is the more decentralized pattern of urban development that is possible within regions with well-developed transport and communications infrastructure. Many of the most successful regions have urban forms that are not dominated by a large central city and have new enterprises developing in a network of smaller cities and greenfield sites. In all high-income nations and many middle- and low-income nations, there has been a growing capacity of cities outside the very large metropolitan areas to attract a significant proportion of new investment. In the nations that have had effective decentralizations, such as Brazil and, in part, India, urban authorities in smaller cities have more resources and capacity to compete for new investment. Trade liberalization and a greater emphasis on exports have also increased the comparative advantage of many smaller cities, while advances in interregional transport and communications have lessened the advantages for businesses in locating in the largest cities.

However, there are also large cities whose population growth rates remained high during the 1980s and 1990s—for instance Dhaka (Bangladesh) and many cities in India and China—and strong economic performance by such cities is the most important factor in explaining this. China has many examples of cities with very rapid population growth rates, which is hardly surprising given the very rapid economic growth that it has sustained over the last two decades. Thus, although some existing large cities may continue to grow rapidly in the low- and middle-income nations with strong economic performance, in general, the urban future is likely to be less dominated by megacities and more by highly connected urban systems. In general, most urbanization in the future will come in low- and middle-income nations with the best economic performance. As such nations invest in improved transport and communications to support this, urban systems will generally become more decentralized. This process will be reinforced if decentralization really increases the capacity and competence of local (municipal, city, and metropolitan) governments.

THE CONTROVERSIES OVER SUSTAINABLE DEVELOPMENT AND CITIES

Although there is a large and diverse literature about sustainable development that goes back 30 years, much of it ignores urban centers or sees urban centers as the problem, with little or no discussion of the role of urban policies and urban management in meeting sustainable development goals. Many national strategies for sustainable development include little or no discussion about urban policy (6). Most of the global reports about sustainability or sustainable development produced by international nongovernmental organizations or U.N. agencies give little detailed consideration to the role of urban policies, the urban governance structures needed to implement sustainable development goals, and often give little attention to the scale of unmet needs in urban areas. The report of the Brundtland Commission, *Our Common Future*, published in 1987, which had considerable importance in getting sustainable development issues more widely discussed by governments and international agencies, was unusual in that it had a chapter on urban issues (14), but this chapter was nearly dropped because of the opposition to a chapter on such issues by some Commission members. The early drafts of Agenda 21, the blueprint for sustainable development, that came out of the Earth Summit, the UN Conference on Environment and Development, hardly mentioned urban centers, and it was only through intensive lobbying by particular U.N. agencies, who felt that urban issues were important, that this omission was addressed in the final version.

When consideration is given to urban centers in discussions of sustainable development, it is usually to their role as centers of pollution and waste. But it can be misleading to attribute to urban centers the resource use, waste, pollution, and greenhouse gas emissions that occur within their boundaries. These arise as a result

of particular industries and commercial and industrial enterprises (or corporations) and middle- and upper-income groups with high consumption lifestyles. They may be concentrated in (particular) urban centers, but it is not only their concentration in these urban centers that is environmentally destructive but also their level of resource use and waste generation. If these production units were dispersed in rural areas, they could reduce their local ecological impact (very large cities generally exceed the capacity of local ecosystems for freshwater, and wastes generated within the city often damage local and sometimes regional water bodies), but their total draw on resources and generation of wastes would not change. A coal fired power station or cement factory does not reduce its fuel use or its generation of greenhouse gases by being located outside a city. By some criteria, the ecological impact of industries and wealthy households would increase if they were dispersed in rural areas, because their spatial dispersion would imply a greater need for motorized transport. Concentrating people and production in cities gives more possibilities of waste reduction, reuse, and recycling and also makes good environmental management cheaper since it is difficult for any environmental agency to check on the emissions and waste disposal practices of industries dispersed through rural regions (6). In addition, concentrating people in cities reduces their per capita resource use. In high-income countries and in the wealthier cities or regions in middle-income countries, it is the middle- or upper-income households with two or more automobiles living in rural areas, small towns, or low density outer suburbs of cities that generally have the highest consumption of resources, generally much more so than those with similar incomes living in cities (15). Thus, in any discussion of how different urban centers perform in regard to sustainable development, it is important to scrutinize the activities taking place and the people living within these urban centers. One particularly wealthy, high-consumption individual or household with several large automobiles, a large inefficiently heated or cooled home, and with frequent use of air travel (for pleasure and work) can have a more damaging global ecological impact than thousands of urban dwellers in informal settlements in low-income nations (6).

There are few valid generalizations for urban centers because of their diversity in terms of size, quality of life, and total or average per capita resource use. Urban centers vary in size from city/regions with tens of millions of people to settlements with a few hundred inhabitants. There is considerable variation in the way that different governments define urban centers; most use population thresholds of between 1000 and 5000 inhabitants to distinguish rural from urban settlements, and some also add criteria regarding density and nonagricultural employment (2, 3). In terms of development, they vary from urban centers in many low-income nations where average life expectancies are very short (below 40 years) and one child in three dies before the age of 5 (virtually all from easily prevented causes) to urban centers where average life expectancies are 80 years and only one child in 200 dies before the age of five. In the urban centers with the very short life expectancies, environmental hazards contribute much to premature death, most of it from infectious diseases and physical accidents; in the urban centers with

high life expectancies, their contribution is much less significant (6, 16). In terms of ecological sustainability, urban centers vary from those with very low levels of resource use and waste generation (and almost insignificant contributions to regional or global ecological problems) to those with very high levels of resource use, waste generation, and regional and global impacts. Unfortunately, the urban centers that perform best by development criteria such as high life expectancy and low infant mortality generally perform worst by ecological sustainability criteria, such as fresh water use, waste volumes, and greenhouse gas emissions per person. As discussed below, however, this is not always the case and need not be so.

Thus, it is difficult to generalize about urban centers' performance in regard to meeting needs and in regard to the use of natural capital. In addition, generalizations about the nature of their problems may be misleading. For instance, much of the literature on current or likely future freshwater shortages suggests the inadequacies in provision for water are linked to water stress. However, an analysis of nations' level of water stress and of the extent of urban provision for water found no association; indeed, those low- and middle-income nations that faced water stress had, on average, better urban provision for water and sanitation than nations with similar per capita incomes that did not (7).

WHAT CRITERIA SHOULD BE USED TO JUDGE SUSTAINABLE DEVELOPMENT IN URBAN AREAS?

Figure 1 summarizes the multiple goals that are within any commitment to sustainable development. According to its original meaning and the one taken up by the World Commission on Environment and Development, or the Brundtland Commission in 1987 (14), the goals are to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. The development component for urban centers is the extent to which their inhabitants' needs are met. These include the need for adequate livelihoods, for adequate shelter [secure, good quality housing with basic infrastructure (for water piped into homes and provision for sanitation, drainage, and solid waste removal)] and for services (including schools, health care and emergency services). During the 1990s, the discussions about urban development in low- and middle-income nations came to recognize that reducing poverty meant not only more secure livelihoods and better housing but also ensuring all urban citizens had the right to exercise their civil and political rights and that they were protected by the rule of law against violence, other crimes, and unsafe working conditions (6, 17). This has an important environmental component because (a) the quality of the home, work, neighborhood, and city environment and (b) the extent to which the inhabitants are protected from biological pathogens and chemical pollutants (in the water, air, soil, or food) or other environmental hazards have a major influence on the health and well-being of the population (6, 18).

Meeting the needs of the present, the development component of sustainable development, requires consideration of whose needs are to be met, what needs, who defines needs, and who obtains more power and resources to ensure they are met. These include economic, social, cultural, health, and political needs as outlined in Figure 1. Major changes are required to meet needs, given that more

MEETING THE NEEDS OF THE PRESENT...

Economic needs---include access to an adequate income/livelihood or productive assets; also economic security when unemployed, ill, disabled, or otherwise unable to work.

Environmental needs---include accommodation that is healthy and safe with adequate provision for piped water, sanitation, and drainage. Also a home, workplace, and living environment protected from environmental hazards, which include air and water pollution. Provision for recreation and for children's play. Shelters and services must meet the specific needs of children and of adults responsible for most child rearing (usually women).

*Social, cultural, and health need*s---include health care, education, and transportation. Needs related to people's choice and control---including homes and neighborhoods that they value and where their social and cultural priorities are met.

Political needs---include freedom to participate in national and local politics and in decisions regarding management and development of one's home and neighborhood within a broader framework that ensures respect for civil and political rights and the implementation of environmental legislation.

SUSTAINABLE DEVELOPMENT AND CITIES

Figure 1   The multiple goals of sustainable development as applied to cities (6).

... WITHOUT COMPROMISING THE ABILITY OF FUTURE
GENERATIONS TO MEET THEIR OWN NEEDS

Minimizing use or waste of nonrenewable resources---includes minimizing the consumption of fossil fuels in housing, commerce, industry, and transport plus substituting renewable sources where feasible. Also, minimizing waste of scarce mineral resources (reduce use, reuse, recycle, and reclaim). There are also cultural, historical, and natural assets within cities that are irreplaceable and thus nonrenewable---for instance, historic districts, and parks and natural landscapes that provide space for play, recreation, and access to nature.

Sustainable use of finite renewable resources---cities drawing on freshwater resources at levels that can be sustained (with efficient use, recycling, and reuse promoted). Keeping to a sustainable ecological footprint in terms of land area on which city-based producers and consumers draw for agricultural, forest products, and biomass fuels.

Biodegradable wastes not overtaxing capacities of renewable sinks (e.g., capacity of a river to break down biodegradable wastes without ecological degradation).

Nonbiodegradable wastes/emissions not overtaxing (finite) capacity of local and global sinks to absorb or dilute them without adverse effects (e.g., especially persistent organic pollutants, greenhouse gases, and stratospheric ozone-depleting chemicals).

Social/human capital that future generations need includes institutional structures to support human rights and good governance and more generally to receive each nation's or social group's rich cultural heritage, knowledge, and experience.

Figure 1   (*Continued*)

than 600 million urban dwellers live in tenements or informal settlements where their lives are constantly at risk (and thus have much reduced life expectancies) because of overcrowded poor quality housing and lack of basic services (6, 16). Much of the urban population in low- and middle-income nations lack safe, regular, and easily accessed piped water supplies and good quality provision for sanitation and drainage (7). A U.N. report published in 2003 shows that the deficiencies in provision for water and sanitation in urban areas of Africa, Asia, and Latin America are much worse than had previously been suggested by official statistics; for instance, it suggests that at least 35 percent of the urban population in Africa and Asia have inadequate provision water and at least half have inadequate provision for sanitation (7). As many as 100 million urban dwellers in low- and middle-income nations have to resort to open defecation, because of the lack of toilet facilities in their homes or nearby (7). Within these nations, it is also common for 30–60 percent of a city's population to live in poor quality one or two-room shacks in squatter settlements or illegal subdivisions; most have very inadequate provision for infrastructure and services, and a high proportion are at constant risk of eviction (5, 6, 19). Many of these informal or illegal settlements are located on land sites in flood plains, along river banks, or on steep slopes (that are at risk from landslides) because these were the only sites in or close to cities on which their inhabitants were able to settle; landowners and governments would not have permitted them to settle on better quality sites (6).

The ecological sustainability component of sustainable development is largely concerned with minimizing the depletion or degradation of the four types of natural capital listed in the lower box of Figure 1. All urban centers depend on renewable resources such as fresh water and the soils and forests from which food, other agricultural crops, and forest products are produced. The economy of a high proportion of all urban centers in low- and middle-income nations is also intimately linked to rural areas because they serve as markets and service centers for the products of agriculture and forests and for those working in rural areas. Many major cities first grew as markets, service centers, and agricultural processing locations for the crops produced in their regions, such as coffee towns, tea towns, fruit and wine towns, sugar towns, or silk-mulberry towns (20).

All urban centers (or rather the population and production systems concentrated there) rely on the renewable sink capacity of the ecosystems within which they are located or adjacent ecosystems to break down the biodegradable wastes they generate. Most wastes arising from production and consumption are biodegradable, but large waste volumes can overwhelm local capacities. Each water body has a finite capacity to break down biodegradable wastes without becoming degraded (and ultimately dead). There are also conflicts between protecting some renewable resources and using sinks, especially as the disposal of wastes into freshwater resources (for instance industries dumping their wastes into rivers or down wells) reduces their quality and/or availability for human use. Most major cities and many smaller urban centers in Africa, Asia, and Latin America have rivers running through them that are heavily polluted, often destroy or

damage fisheries, and pose serious hazards for communities downriver who use the water (6).

Any examination of the use made by urban consumers and businesses of renewable resources and sinks and of their linkages with rural producers and ecosystems within their own region and beyond highlights how sustainable urban development and sustainable rural development cannot be separated. The rural-urban linkages can be positive in both developmental and environmental terms. Demand for rural produce from urban-based enterprises and households can support prosperous farms and rural settlements, where natural capital is not being depleted. Few governments appreciate the extent to which productive intensive agriculture can support development goals in both rural and urban areas, in part because no professional group or government institution has the responsibility to understand and support this (21, 22). Increasing agricultural production can also support urban development within or close to the main farming areas—the two supporting each other. Although for this to happen, generally a relatively equitable land owning structure and a concentration of relatively small farms (each producing good livings for those farming them based on relatively high-value crops) are required (20, 21). There are also many examples of less ecologically damaging interactions between urban wastes and surrounding areas. For instance, organic solid and liquid wastes that originate from urban-based consumers or industries are returned to soils, which demonstrates alternatives to the heavy use of artificial fertilizers and to the disregard of nutrients within city wastes (23). Urban agriculture also has particular importance in much of Africa, Asia, and Latin America, both as a livelihood or part of a livelihood for many households and as a system of production that is relatively efficient in energy input terms and helps keep food costs down (24). However, there are also the negative aspects that rural-urban links can have. For instance, when agricultural land is lost as cities' built-up areas expand without control, land speculation on urban fringes drives out cultivators. Enterprises on city fringes can also damage agricultural production; examples include quarries, brick-making plants, and sites from which landfill is drawn that expand over farmland (6).

Thus, if urban citizens and their governments are committed to sustainable development, they should be concerned about the impact of their resource use and waste generation on the region around the city, even though much of this is generally outside the official urban boundaries and outside the city government's jurisdiction. For instance, consider the importance of protecting trees, woods, and forests in the region around cities. Forests have key local ecological roles in protecting watersheds (and preventing soil erosion), regulating water flows (and preventing floods), maintaining local biodiversity, and moderating climatic extremes (25). A great range of forest products are important for city consumers and producers—especially in regions where fuelwood or charcoal are still widely used as fuels by urban households. Other important forest derivatives include timber and "a variety of foods including bushmeat . . . framing, panelling and thatching materials, and a range of other goods including berries, nuts, fruit, wild animals, honey, resins, oils,

rattan and medical products" (26). Forests are also a key part of natural landscapes to which city dwellers want access for recreation. In addition, forests have key global roles within the carbon cycle and with maintaining global biodiversity.

Deforestation or forest depletion is likely to have a number of effects on urban centers. Perhaps the most serious economic impacts are the loss of employment, income, and consumption goods for urban centers in areas where forest exploitation is a significant part of the local economy. There is also the increasing difficulty experienced by those living in such settlements in obtaining fuel. The ecological effects of deforestation, which include changes in runoff and subsequent erosion, may add to the risk of small floods, reduce the capacity of hydroelectric stations (whose electricity is usually destined for urban consumers or enterprises), and reduce the productivity of agriculture. Deforestation of river catchments and associated soil erosion may be a contributory factor in floods that devastate large areas downstream, in cities or city districts built alongside rivers (27). All this highlights the need for good forest protection and management in and around cities, within governance structures that ensure that such management is not oriented only to the needs of powerful groups. But this usually does not happen, because the areas in most need of good management typically fall outside the boundaries of city authorities or because of the incapacity or unwillingness of government agencies to control private developments that cause deforestation. However, no assumption should be made that city development in low-income nations is associated with widening circles of deforestation because of demand for fuelwood or charcoal; in many instances, it is not. Demand can stimulate reforestation or cause much of the city population to shift to the use of other fuels (28).

The need for much improved management of coastal areas provides another example of the institutional difficulties. A large proportion of the world's urban population (and many of its largest cities) is in coastal areas. Tens of millions of people depend, directly or indirectly, on coastal and marine ecosystems for their livelihoods from fishing and also from tourism. A great range of resources is drawn from such ecosystems, in part, because of the high productivity of near-shore waters and mangroves. Coastal areas are also widely used as sources of building materials and as dumping grounds for sewage, storm and surface runoff, industrial effluents (often including toxic wastes), and garbage. In most coastal areas in low- and middle-income nations, there is little provision to protect key resources such as mangroves and coral reefs with their multiple productive and protective functions. The result is that they are generally being used and degraded or polluted by powerful economic interests to the detriment not only of the environment but also of the livelihoods of large numbers of low-income groups.

ECOLOGICAL FOOTPRINTS OF CITIES

Consideration of the use of resources and sinks by producers and consumers located in any urban center must also take into account the ecological impacts of this use in distant regions. In general, the larger and wealthier the urban center, the

larger the area from which resources are drawn. Many cities now draw on the freshwater resources of distant ecosystems, as their demand for freshwater has long exceeded local capacities and often destroyed local capacities by overexploiting groundwater and polluting surface water (7). Dakar, the capital of Senegal, now needs to draw water from a lake 200 km away (29); Mexico City has to supplement local supplies with water drawn from neighboring basins that has to be pumped over 1000 meters in height and drawn from up to 150 km away (30). Prosperous cities also draw heavily on the resources and waste-assimilation capacities of "distant elsewheres"—as highlighted by the concept developed by William Rees of cities' ecological footprints (31, 32). A city may perform extremely well in environmental terms in regard to having a safe, stimulating environment for its inhabitants and a very well-managed region around it (with good watershed management, many forests, and careful protection of sites of particular scientific interest), yet it can have a very high environmental impact on distant regional systems and on global systems because of the high demand from its population and businesses for goods whose fabrication and transport to that city required high resource inputs and generated high levels of pollution and greenhouse gas emissions. This is part of a more general tendency for cities to pass on environmental burdens to other people, other ecosystems, or to global systems as they become more prosperous and larger (33). The lower Fraser Valley, in which the city of Vancouver is located, has an ecological footprint that is about 20 times its actual area, to produce the food and forestry products its inhabitants and businesses use and to grow vegetation to absorb the carbon dioxide that they create (31). London's ecological footprint is estimated to be 125 times its actual size, based on similar criteria (34). Small relatively poor urban centers generally have ecological footprints that are relatively small and very local. Most of the largest more wealthy cities draw resources from huge areas; many extend beyond their nations' borders and have high levels of greenhouse gas emissions as discussed in detail below. It can be misleading to compare the ecological footprints of cities in that there are large disparities within any city population in regard to a household's ecological footprint. For instance, the poorest 20 percent of Canada's population have average ecological footprints that are less than a quarter of those of the wealthiest 20 percent of the population (32). The disparities between the ecological footprints of high-income and low-income households in cities in low- and middle-income nations is likely to be much larger than this.

NONRENEWABLE RESOURCES AND SINKS

There are also dramatic contrasts between high-income nations and low-income nations in regard to the use of nonrenewable resources and sinks. Most high-income nations have levels of commercial energy consumption per person that are 20 to 30 times that in many low-income nations (35). Comparable contrasts exist between per capita consumption in rich and poor nations for most nonrenewable resources. There are fewer figures comparing city populations' nonrenewable resource

consumption, but those that do exist also show very large differences. Gasoline use per capita in cities, such as Houston, Detroit, and Los Angeles, with among the world's highest consumption levels, are 100 times or more those of most cities in low-income nations (36). Average waste generation per inhabitant in urban centers can vary more than 20-fold when comparing urban citizens in high-income nations (who may generate 1000 kg or more of waste per person per year) to those in some of the lowest-income nations (who may generate less than 50 kg per person per year) (5, 6). The disparities in terms of the amount of nonrenewable resources thrown away in the garbage (especially metals) are much higher because of the higher proportion of metals discarded in the household wastes in cities in high-income nations. Indeed, many low-income urban dwellers in Africa and Asia hardly throw away any nonrenewable resources because they cannot afford goods made from such resources; many do the opposite (in effect they create nonrenewable resources) because their livelihoods are based on finding and reclaiming items from waste streams for reuse or recycling (5).

This comparison of nonrenewable resource consumption between nations or between cities can be misleading in that it is the middle- and upper-income groups that account for most resource use and most generation of household wastes. This becomes a high-income:low-income country issue (or a North:South issue) because most of the world's middle- and upper-income people with high consumption lifestyles live in Europe, North America, and Japan, and because international politics reflect this imbalance. High-income households in cities such as Lagos, Sao Paulo, and Bangkok may have levels of nonrenewable resource use comparable to high-income households in Los Angeles or Houston; it is primarily the fact that there are fewer of them within the city population that keeps city averages much lower.

It can also be misleading to measure each person's contribution to unsustainable levels of resource use and waste generation by the total waste volumes they generate in that it is their use of particular resources and generation of particular wastes that threaten ecological sustainability. If we focus on those consumer goods whose fabrication involved high levels of pollution (including for instance persistent organic pollutants) and on wastes that have worrying ecological implications (such as used batteries), the differentials between low- and high-income groups is likely to be even larger than just for waste volumes. The dates at which the price of nonrenewable resources will begin to rise rapidly, reflecting depletion of their stocks, may have been overstated in the various reports produced during the 1970s, but the finite nature of nonrenewable resource stocks is not in doubt. There may be sufficient nonrenewable resources to ensure that 9–10 billion people on earth, late in this century, have their needs met. But it is unlikely that the world's resource base could sustain a world population of 9 or 10 billion with a per capita consumption of nonrenewable resources similar to those enjoyed by the richest households today. However, one of the important shifts in our understanding of the ecological limits to growth since the 1970s has been that these center much more on the likely costs that will arise if greenhouse gas emissions are not controlled and on the depletion or

degradation of resources that should be renewable (soils, forests, and freshwater) than from the depletion of the nonrenewable resource base.

URBAN CENTERS AND GLOBAL SYSTEMS

The disparities in greenhouse gas emissions per person between countries or cities in high-income and low-income countries are as striking as those outlined above in terms of nonrenewable resource use (to which many are obviously related). Per capita carbon dioxide emissions in 1996 in the United States were 200 to 500 times those in many low-income nations (37). Cities such as Canberra, Chicago, and Los Angeles have between 6 and 9 times the carbon dioxide emissions per person of the world's average and 25 or more times that of cities such as Dhaka (38). There is also the issue not only of who is currently contributing most to global warming but who historically contributed most. One estimate suggests that Western Europe and North America together have been responsible for 61 percent of all emissions since 1800, although they only contain 10 percent of the world's population (39). Before the international measures taken to control their use, the per capita disparities for the use of chlorofluorocarbons and halons (the main causes of stratospheric ozone depletion) were just as striking; figures for 1986 show that most high-income countries had around 100 times the use of many low-income nations (40). This discussion of the interaction between city-based production and consumption and resources and sinks from beyond the city boundaries is a reminder that the goal is not sustainable cities but cities that contribute to sustainable development goals—within their boundaries, in the region around them, and globally. A concentration on sustainable cities focuses too much on achieving ecological sustainability within increasingly isolated ecoregions or bioregions. Seeking sustainable cities implies that each city has to meet the resource needs of the population and enterprises located there from its immediate surrounds. But the goals of sustainable development are the meeting of human needs within all cities (and rural areas) with a level of resource use and waste generation within each region, the nation, and the planet that is compatible with ecological sustainability. It is unrealistic to demand that major cities should be supported by the resources produced in their immediate surrounds, but it is entirely appropriate to require that consumers and producers in high-consumption, high waste cities reduce their level of resource use and waste and reduce or halt the damaging ecological impacts of their demands for freshwater and other resources on their surrounds (41).

Although the discussions and recommendations about sustainable cities have much relevance to reducing the depletion of natural capital caused by production and consumption in cities in high-income nations, they concentrate too much on individual city performance. What is more important for sustainable development is the local, national, and international frameworks needed to ensure the achievement of sustainable development goals worldwide, including the appropriate frameworks for cities and smaller urban centers.

WHAT SUSTAINABLE DEVELOPMENT IMPLIES
FOR URBAN AUTHORITIES

A commitment to sustainable development by city or municipal authorities means adding new goals to those that are their traditional concerns. Meeting development goals has long been among their main responsibilities. These generally include attracting new investment, better social conditions (and fewer social problems), ensuring basic services and adequate housing, and (more recently) better environmental standards within their jurisdiction. This does not imply that city and municipal authorities need be major providers of housing and basic services, but they can act as supervisors and/or supporters of private or community provision.

A concern for sustainable development retains these conventional concerns and adds two more. The first is a concern for the environmental impact of urban-based production and consumption on the needs of all people, not just those within their jurisdiction. The second is an understanding of the finite nature of many natural resources (or the ecosystems from which they are drawn) and of the capacities of natural systems in the wider regional, national, and international context to absorb or break down wastes. Historically, these have not been considered within the purview of city authorities. Indeed, many cities in high-income nations have only made considerable progress in achieving sustainable development goals within their own boundaries (i.e., reducing poverty, ensuring high quality living environments, protecting local ecosystems, and developing more representative and accountable government) by drawing heavily on the environmental capital of other regions or nations and on the waste absorption capacity of "the global commons" (31, 33). But in the long term, all cities will suffer if the aggregate impact of all cities' production and their inhabitants' consumption draws on global resources at unsustainable rates and deposits wastes in global sinks at levels that disrupt the functioning of ecosystems and global cycles. A large proportion of the world's urban population are particularly at risk from the growth in the number and intensity of extreme weather events that are likely to occur if greenhouse gas emissions are not controlled (42).

Adding a concern for ecological sustainability onto existing development concerns means setting limits on the rights of city enterprises or consumers to use scarce resources (wherever they come from) and to generate nonbiodegradable wastes. Such limits can be implemented through local authorities' guidelines and regulations in planning and regulating the built environment, e.g., building material production, construction, building design and performance, site and settlement planning, and efficiency standards for appliances and fixtures. Goals relating to local or global ecological sustainability can be incorporated into the norms, codes, and regulations that influence the built environment and its heating or cooling. But city authorities need national guidelines and often national encouragement. In most political systems, national governments have the primary role in developing guidelines and supporting innovation allied to regional or global conventions or guidelines where international agreement is reached on setting such limits.

But care is needed not to stifle local innovation with national standards. Urban authorities need a national policy with a supporting legislative, fiscal, and regulatory framework to help them add a concern for ecological sustainability into their policies, regulations, and investment patterns. It also remains the task of national government to consider the social and environmental impacts of macroeconomic and sectoral policies, which may contribute to the very problems their sustainable development policies are seeking to avoid. But urban authorities have the most critical role in actually implementing sustainability measures. Even in the absence of national policies, many city authorities have demonstrated their commitment to sustainable development, as in the many local authorities in the United States who have committed themselves to reducing greenhouse gas emissions within their boundaries, despite the U.S. government's opposition to a global convention that would require such reductions. Indeed, one of the most important roles for urban authorities in high-income nations and in the more prosperous cities in middle-income nations is promoting the necessary delinking of high standards of living/quality of life from high levels of resource use and waste generation. The different environmental emphases that can be given within any sustainable development policy is made clear by Haughton's unpacking of the different aspects of environmental equity. He suggests that we think of sustainable development as seeking to reconcile five different dimensions of environmental equity:

- Intragenerational equity (as measured by equity in access to basic services, such as water supply, sanitation, and primary health care, and in protection from environmental hazards, especially flooding, landslides, and high levels of air pollution);

- intergenerational equity (as measured by the extent to which there are effective policies to help conserve soils and forests, make efficient use of freshwater resources, reduce nonbiodegradable wastes, and keep down greenhouse gas emissions);

- geographical or trans-boundary equity (as measured by the extent to which environmental cost transfers from city-based production or consumption are avoided, such as in damage to local water bodies from liquid and solid wastes and control of air pollution that causes acid rain);

- procedural equity grounded in legal and political systems that treat all sections of the population equally (as measured by the extent to which different stakeholders benefit from public investments and policies and the extent to which they are involved in developing and implementing local environmental plans); and

- interspecies equity, as measured by the extent to which preserving ecosystem integrity and areas of particular importance for biodiversity are integrated into environmental plans (43).

Many proponents of sustainable development concentrate on only one or two of these aspects and may indeed promote actions that go against the other dimensions,

as in forcing local populations off land they have long utilized (and may even own) to create wildlife reserves or green belts. However, while Figure 1 and the above checklist are useful for governments in developing policies to contribute toward sustainable development goals, experience to date suggests that the actual policies and the priorities must be developed locally, so they respond to local circumstances, including local opportunities and constraints. Given the diversity of cities and smaller urban centers in terms of their size and population growth rates and of their economic, social, political, cultural, and ecological underpinnings, it is difficult to consider urban policy and management for sustainable development in general terms. Priorities in a move toward sustainable development are going to differ greatly from city to city. For cities (or urban systems) with high levels of nonrenewable resource use, the main need is to reduce fossil fuel use and waste generation (through reducing waste levels and through more recycling) while maintaining a productive, stable, and innovative economy and a better record in ensuring benefits for lower-income or otherwise disadvantaged groups. Some clues as to how this can be achieved might be found in the cities that currently have among the world's best living standards but a relatively small draw on environmental capital, and this is not simply the result of a less energy intensive economic base. For instance, cities, such as Copenhagen and Amsterdam, have one third of the carbon dioxide emissions per person from transport of Detroit and Houston, yet many would consider Copenhagen and Amsterdam to have a superior quality of life (36). There is also the growing body of evidence that increasing prosperity need not imply increased resource use and waste; indeed, prosperity can increase while resource use and waste generation are cut (44).

For cities or smaller urban centers with low levels of nonrenewable resource use and waste generation (which usually implies a relatively low-income city), the priority is meeting development needs, but there are precedents to show that this is not incompatible with policies and practices that ensure the efficient use of natural capital. For example, some urban governments' responses to the action plan of the U.N. Conference on Environment and Development in 1992 (Agenda 21) were remarkable, especially in light of the relatively modest sums national governments and international development agencies devoted to these Local Agenda 21s. Some of the most successful Local Agenda 21s have been in Latin America, and in particular in those urban centers where a combination of democratization, decentralization, and growing environmental awareness was already spurring socially-concerned environmental movements (6, 45–47). By combining environmental awareness with good local governance, it is clearly possible to reconcile development and environmental imperatives.

If low- and middle-income nations are able to develop more stable and prosperous economies, they make increased use of nonrenewable resources, and their greenhouse gas emissions per capita are also likely to increase. The extent of this growth in the use of natural capital depends not only on the level of wealth created and its distribution but also on the extent to which provisions are made, now and in the immediate future, to promote efficient resource use and waste minimization.

For example, in rapidly growing cities, measures to encourage fuel-efficient buildings and land use patterns that respond to citizens' priorities for easy access to employment and services within fuel-efficient transport systems can, over time, bring increasingly large savings in the use of fossil fuels (and thus also in the emissions of greenhouse gases) relative to wealth. Curitiba in Brazil is now applauded for its innovative and widely used public transport systems, but the innovations that led to this were put in place nearly 40 years ago (48). Major cities in the western United States, including Los Angeles, have continued to grow over the past several decades, but their total water use has leveled off or even declined as overall water-use efficiency and productivity has improved (49).

BUILDING SYNERGIES, AVOIDING CONFLICTS

When city governments consider how to apply a sustainable development framework to their operations and their urban policies and projects (or national governments and international agencies seek to support them in doing so), there are obvious tensions between different goals within the two boxes in Figure 1 and also between the five different equity goals noted above. Most center on the extent to which projects or investments justified for their contribution to expanding production (which in turn is meant to increase incomes and help meet human needs) contribute to the depletion of one or more aspects of natural capital; for instance, fossil-fueled power stations or much expanded highway systems that will increase motor-vehicle use and therefore increase greenhouse gas emissions. Within environmental policies, there are obvious conflicts between what is often termed "the brown agenda," which concentrates on environmental health, and "the green agenda," which concentrates on the contribution of urban-based production, consumption, and waste generation to ecosystem disruption, resource depletion, and global climate change (50). There are also rural versus urban conflicts as in, for instance, large hydroelectric dams whose construction involves flooding large areas of agricultural land and forest with most of the electricity destined for urban enterprises or consumers. Expanding urban areas inevitably draw more on the resources of their wider regions; increasingly prosperous urban areas almost inevitably draw more heavily on nonrenewable resources and create more wastes.

In part, it is only when the different goals are pursued independently that there are serious conflicts. If pursued in tandem, important complementaries can be found between safer, healthier city environments and reduced depletion of natural capital. Such complementarities include:

1. Systems for the management of liquid and solid wastes that reduce environmental hazards for city dwellers and also reduce nonrenewable resource use (through promoting waste minimization, reuse, and recycling) and reduce the ecological damage that previously arose from polluted surface runoff.

2. Improvements to public transport that better meet the transport needs of most citizens (especially lower-income groups), reduce physical hazards

(road accidents are often among the main causes of premature death and serious injury for adults), and keep down air pollution and greenhouse gas emissions.

There are often more complementarities between contrasting agendas than might initially appear evident. For instance, the priority of those espousing the brown agenda to expand the number of households connected to piped water systems (which implies increased household consumption for those who previously relied on public standpipes or vendors) seems to conflict with those espousing a green agenda who want to keep down the use of freshwater (to avoid depleting groundwater reserves or drawing water from more distant watersheds) and who recommend increasing water prices to encourage conservation. But both agendas can be served by better water management. Support for improving water-use efficiency and better maintenance of piped water systems can often free up sufficient new water supplies for ecosystem restoration or new users, and extending the piped water systems can help ensure that this new water can be accessed by those who need it most. In addition, the cost of extending water supplies can in part be met by charging the enterprises and households who are connected to the system more realistic prices, with tariff structures that discourage high consumption levels while ensuring that poorer populations can afford water for basic needs (7, 51). Although there will still be trade-offs—for instance, the cheapest or most robust buses may not be the best performers in terms of polluting emissions and fuel use, decisions made within an awareness of such trade-offs and with procedural equity should considerably reduce the conflicts between ecological sustainability and development.

One of the more controversial aspects is in regard to the choice of systems to improve sanitation, but health and ecological concerns can be combined. For those whose primary concern is public health, water-borne sewers are often seen as the best sanitation system for large and dense cities. When well managed, they provide a very safe and convenient way by which households can dispose of their human wastes. From an environmental health perspective, they are very effective because the diseases caused by human excreta and inadequate waste-water management are among the world's main causes of infant and child death and illness (18). Although water-borne sewers are considered to be expensive solutions for the poor, there are also examples, such as the Orangi Project in Pakistan, where costs were kept down to the point where little or no subsidy was needed in providing low-income households with sewers (52). But from an ecological perspective, city sewer systems generally require high levels of freshwater use and by collecting all the wastes within a single system, they can present serious problems in regard to what can be done with the large volume of sewage. Sewage can be treated, but for low- and middle-income nations, going beyond primary treatment is expensive if centralized mechanical systems are used. Disposing of sewage sludge is also a problem, especially for large sewer systems. However, potential conflicts can be minimized if decisions about which sanitation system best addresses the needs and resources of the inhabitants of a city or settlement are made within an awareness

of both the human and ecological consequences. There are many sewer systems and water-flushed toilets in operation that minimize the volume of water needed. There are also systems in which treatment is decentralized, and the ecological impacts of the whole sewer and drainage system are much reduced. There are examples of "sewage farming" and sewage-fed aquaculture, which make use of the nutrients in sewage and act as treatment, although care must be taken to minimize health risks for those working in these activities and to ensure no health risk to those who consume the products of sewage farming. It is important that the full range of potential solutions to sanitation problems in any city or city district are considered, but with the needs and priorities of those whose sanitation is most in need of improvement should also have a central role. In pursuing sanitation systems with less ecological impact, there is a danger of promoting systems that bring inconvenience, higher maintenance costs, and greater environmental risks to the users—or of simply producing latrines that the population does not use (7).

ENABLING LOCAL ACTION WHILE MEETING NATIONAL AND GLOBAL GOALS

As noted earlier, the literature on sustainable development often concentrates too much on national policies and national strategies but gives too little attention to the changes needed in each locality and in the role of local governments. Is it possible to reconcile a concern for global sustainability with the need for development determined within democratic local structures? There is an obvious need for international agreements to set limits for each national society's consumption of resources and use of the global sink for their wastes. But many of the actions to achieve this depend on actions taken locally—by households, businesses, and local governments. The interaction of each city with local and regional ecosystems is unique, which implies the need for optimal use of local resources, knowledge, and skills. This demands a considerable degree of local self-determination, because centralized decision-making structures have great difficulty in developing policies that respond appropriately to such diversity.

Much of what has been discussed above stresses the concept of central government as an enabler, developing the laws, institutions, and policies that support and encourage individuals, households, communities, enterprises, and local governments to undertake economic, social, and environmental activities, which contribute to sustainable development. The discussion of government as an enabler has a long history. Within the evolution of development theory, it is perhaps through discussions of appropriate housing policies that the importance of an enabling policy has been stressed, and its form made most explicit. The origins of the idea that government actions in regard to housing should concentrate on enabling and supporting the efforts of citizens and their community organizations to develop their own housing goes back at least to the 1950s and perhaps earlier (53, 54). The concept of enablement has also spread to many other sectors; for instance,

in the organization of agricultural extension services (with the shift to participatory learning and action) and in the construction, organization, and management of many forms of infrastructure and services at the community or neighborhood level (e.g., for health care services, water supplies, and provision for sanitation). However, it is also often appropriate to set national standards. In the United States, a national standard for water use by toilets was set at 1.6 gallons per flush, and this took the decision about water use in toilets out of the hands of individual manufacturers and local and state governments.

The concept of enablement is based on the understanding that most human investments, activities and choices that influence the achievement of development goals and sustainability goals take place outside government. Most are beyond the control of governments (or at least of democratic governments) even where governments seek some control. In cities in Africa and much of Asia and Latin America, the point is particularly valid because most homes, neighborhoods, jobs, and incomes are created outside of government and often in contravention of official rules and regulations (6, 19). There is the long-established understanding that inappropriate government controls and regulations discourage and distort the scale and vitality of individual, family, and community investments and activities. But there is also recognition that without scrupulously enforced controls and regulations, individuals, communities, and enterprises can impose their externalities on others. The wave of environmental health centered reforms of city and municipal governments in Europe and North America in the late nineteenth and early twentieth centuries developed systems of urban governance to ensure better provision in the supply of water and the disposal of liquid and solid wastes. Similar reforms were also evident in many Latin American countries. Environmental legislation in the second half of the twentieth century has centered on government control of air, water pollution, and solid waste generation and disposal that imposed costs on urban citizens and on the citizens and ecosystems beyond the city boundaries. In each instance, central government had to provide the framework for action, and it was generally city and municipal governments that had to act; successful government enablement is always a careful balance between encouragement and control.

The need for governments to seek a balance between encouragement and control has received considerable support from the growing recognition that democratic and participatory government structures are not only important goals of development but also important means for achieving development goals. Participation and enablement are inseparable since popular priorities and demands should be a major influence on the development of enabling policies, while these policies in turn should provide plenty of scope for locally-determined solutions. The concept of government policies and institutions as rooted in enablement has a much wider relevance because it is important to the promotion of greater ecological sustainability as well as development. It would be politically unacceptable in most societies for governments to substantially restrict individual consumption levels, but sustainable development worldwide is impossible without national frameworks

that promote substantially lower levels of demand by wealthy households on the world's natural capital.

IMPLEMENTING SUSTAINABLE DEVELOPMENT IN CITIES

The regulations and incentives needed to support the achievement of development goals, within a framework that promotes local and global ecological sustainability, is relatively easy to conceive as an abstract exercise. The poverty suffered by the minority of urban dwellers in richer nations and the majority in poorer nations can be drastically reduced without a large expansion in resource use (and waste generation). The economic and ecological costs of providing safe and sufficient water supplies, provision for sanitation, garbage removal, and health care and ensuring safe, secure shelters are often overstated. The quality of life of wealthy (generally high-consumption) individuals and households need not diminish and in certain aspects may indeed improve within a long-term program to cut their draw on the world's natural capital (44).

But translating this into reality within nations and globally is another issue. Powerful vested interests oppose most of the needed policies and priorities. For instance, reducing the resource use and greenhouse gas emissions of middle- and upper-income groups implies less profits for many companies and their politically influential coalitions, and the fact that it may also mean more profits for as yet unformed coalitions is largely irrelevant politically. Economic vested interests are particularly strong in the richest nations, but it is in these nations where changes are also most needed, for at least three reasons:

1. These are the nations with the highest current and historic contributions to greenhouse gases.
2. These nations have no moral basis for demanding more resource conserving (less greenhouse gas emitting) patterns of development among lower income nations unless they (and their wealthiest citizens) set an example of how to combine high quality lives with much lower resource use and waste generation.
3. Low-income nations that need to develop a stronger and more prosperous economic base will generally need to increase their greenhouse gas emissions, and only by reducing emissions per person in the richer nations can this be possible, within a commitment to restrict global greenhouse gas emissions.

Large cuts in greenhouse gas emissions within the richest countries will bring higher costs, especially to those who currently consume most. Technological change can help limit the rise in costs. Examples include moderating the impact of rising gasoline prices through the relatively rapid introduction of increasingly fuel-efficient automobiles and moderating the impact of higher electricity prices

(especially where these are generated by fossil-fueled power stations) through more efficient electrical appliances and better designed and managed buildings that restrict the need for space heating or cooling. Many industries can also limit the impact of higher fossil fuel prices or water scarcity by increasing the efficiency with which fuel or water is used. In addition, a steady increase in the price of resources increases the economic incentives to replace them with renewable sources or improvements in efficiency (and technological change helps reduce the cost of tapping alternative resources). The scope for using renewable energy resources for space heating and cooling is also much increased in energy-efficient buildings. But if combating atmospheric warming does demand a rapid reduction in greenhouse gas emissions in high-income nations, this may require limitations in middle- and upper-income groups' right to use inefficient private automobiles, have unlimited air travel, and use inefficient space heating or cooling, which cannot be met by new technologies and alternative (renewable) fuels—at least at costs which will prove politically possible. In addition, so many existing commercial, industrial, and residential buildings and urban forms (for instance low density suburban developments and out-of-town shopping malls) have high levels of energy use built into them, and these are not easily or rapidly changed.

At the same time, in Africa, Asia, and Latin America, the achievement of development goals that minimize the call on local and global natural capital demands a competence and capacity to act by city and municipal government that is currently rarely present. There is a widely shared recognition that too little attention has been paid by most governments in low-income nations and by most international agencies to developing the competence, capacity, and accountability of urban governments (5, 6). As noted by Stren, one of the most experienced specialists on issues of urban governance, in a review of African cities: "ultimately, solutions to problems of urban finance, housing, public transport, the siting and standards of urban infrastructure, public health and public cleansing services, water, electricity and numerous other urban amenities must be formulated locally, by local people, on the basis of local experience and information" (55). It is difficult to see much success in the achievement of both the development and the ecological sustainability components of sustainable development in urban areas in low- and middle-income nations without more competent, effective, accountable local governments. Local governments cannot take on these roles without a stronger financial base, the support of national government, and an appropriate legislative, regulatory, and incentive structure (5, 6). There is also the need for mechanisms to allow resource transfers between local governments otherwise only local governments in more prosperous areas will have the resources to address development and sustainability goals.

There is also a recognition that the capacity of local government to work in partnership with community organizations, nongovernment organizations, nonprofit foundations, and private sector enterprises is central to the achievement of development goals, and this is especially true when economic circumstances limit the investment capacity of local government. This stress on the importance of such

partnerships is evident in Agenda 21 that came out of the U.N. Earth Summit in 1992 and also in the recommendations that came out of the 2002 U.N. Summit on Sustainable Development. A stress on enablement at local level is to provide the support and advice that will encourage community initiatives and multiply many-fold the number that start and succeed. Such policy directions imply the need for new kinds of enabling institutions widely distributed within each nation to provide funding and technical advice (56).

THE GLOBAL CONTEXT FOR SUSTAINABILITY AND DEVELOPMENT

Citizen pressure has often helped persuade city and municipal governments to pursue more sustainable patterns of resource use and waste minimization, where the ecological impacts are local, regional, or (on occasion) national. This can be seen in the environmental movements and in the role taken by environmental issues in election campaigns. But most of these have been driven by citizen concern for their own health or quality of life. As Haughton points out, nearly everyone is an environmentalist in the sense of wanting a good environment for themselves. But so much environmental pressure is by groups with power wanting to protect or improve their environment at the expense of others (43). Examples include:

1. Parks and nature reserves that serve to prevent low-income groups from accessing land on which to develop their own homes,
2. Middle class pressure that ensures dirty industries or facilities are located in low-income areas, and
3. Cities that export their environmental problems.

There is less citizen pressure on city and municipal governments for changes in production and consumption patterns that have their most serious ecological impacts overseas or on global cycles. Yet the achievement of sustainable development depends on city residents, businesses, and governments reducing the ecological damage to which they contribute far beyond the city boundaries and reducing greenhouse gas emissions. There are some important signs of change. One example is termed "green consumerism" in which consumers choose goods whose fabrication or use has less damaging environmental consequences; this is supported by ecolabeling and has put pressure on many manufacturers to address the environmental implications of their products' fabrication, use, and disposal. In the European Ecolabel scheme set up by the European Union, which operates in 18 nations, enterprises can use the label on their products if they have below average environmental impacts on the basis of life cycle assessments, and in each nation, a national body is responsible for administering the program (57). The International Standards Organization (ISO) also seeks to promote better working practices, environmental management, and product standards through the various

ISO standards awarded to products. The "fair-trade" campaigns and the sale of fair-trade goods have helped to raise issues such as the wages and/or working conditions of those who make the goods and the prices they are paid. Many European nations have fair-trade labeling organizations, and by 2002, 350 fair-trade certified producer groups in 36 nations were selling to importers and retailers in 17 nations (58). In the United Kingdom, the retail value of fair-trade products reached more than US$65 million in 2001, some 16 times more than in 1994 (58). Human rights campaigns and environmental groups have put pressure on large producers and retailers to take what is usually termed "ethical sourcing" more seriously by avoiding the use of goods produced in countries, or by companies, with poor human rights, labor, and environmental records. Many companies' unethical investments, products, or poor environmental performance have been exposed by campaigns to promote consumer boycotts of their products (for instance, to boycott the products of Nestle because of their promotion of alternatives to breast milk in countries where this often increases health risks for babies) or by environmental or human rights campaigners who purchase some shares and bring pressure on the company at shareholder meetings. There are examples of companies (including multinational corporations) that have made explicit commitments to improve environmental performance or to provide better wages and working conditions for their workforce or for those working for major subcontractors. Gap Incorporated reports that it has developed a code for the companies from which it purchases goods that spells out its expectations regarding wages, child labor, health, and safety issues and respecting the rights of the workers, and it has a Global Compliance department to monitor suppliers' performance (59). There are even some companies that allow independent audits to check on their claims. Governments in most high-income nations have encouraged or supported ecolabeling and the control of certain imports for ethical or environmental reasons. All these have importance because they show ways of lessening the human and environmental costs of production in distant elsewheres.

But the extent to which this can become sufficiently effective on a global scale is in doubt. Labeling schemes implemented or checked by independent third parties can have beneficial impacts and can influence a proportion of the market, but they are unlikely to influence enough of it to make the needed difference. Up to a point, the demand for products with lower human and environmental costs can be met by reshuffling the existing product mix, which increases the average human and environmental cost of unlabeled products. The perception that this is happening (whether or not it actually is) can further undermine the demand for ecolabeled products.

Then there are the vast imbalances in power between multinational companies with their chains of production, distribution, sale, and promotion and the citizen groups that raise these issues. The people who are currently affected most by the international transfer of environmental costs, i.e., the workforce exposed to dangerous or oppressive working conditions and the inhabitants suffering from high air pollution levels and other environmental impacts, often have little political

influence in the countries where they live and none at all on the governments of the nations to which the goods they helped produce are exported.

Individually, they are often free to choose between dangerous working conditions and even lower incomes (if they give up their jobs), but even collectively they have little influence over how and to what extent their employers can be held responsible for improving their working conditions. Individually, they are often free to choose between unhealthy living environments and an even higher cost of living (implying lower consumption), but they rarely have the opportunity to promote the sort of changes that might help them and their neighbors avoid such predicaments. They often face difficulties within their own nations because they risk losing their livelihood if they are part of any protest against low wages, working conditions, or environmental abuses. It is perhaps difficult for those of us living in high-income countries to appreciate this, but it is often politically dangerous to protest. Two of the Peruvians who helped launch the campaign against pollution in Chimbote (Peru) and helped develop the city's Local Agenda 21 were imprisoned for 13 months and falsely accused of being terrorists; it was only after a strong national and international campaign that they were released (60). Meanwhile, national and city governments desperate to attract new investment and to boost exports so often do not support citizens' environmental concerns. And if the key needs and priorities of so much of the present generation cannot be protected from international production and trading systems, how much less are the needs and priorities of future generations likely to be protected?

There is some international action to prevent the most obvious and blatant international transfers of environmental costs, such as in the controls on the export of hazardous wastes, and on the trade in endangered species or products derived from them. But the interests of many of the world's most powerful companies and corporations would be threatened if action extended to address all such transfers—for instance, if governments in Europe and North America only permitted imports from countries where good standards of occupational health and safety are maintained. Another control might permit the import of goods produced by multinational companies only if the company and its main subcontractors met agreed standards for good environmental practices in the use of resources and the generation and management of wastes in all its operations in different countries and allowed independent groups to monitor their performance. Moreover, even if such standards were agreed upon, there is the danger that those affected by the environmental transfers would not be effectively represented in their negotiation, and the resulting agreements might do them more harm than good by undermining rather than enhancing their local negotiating positions.

In conclusion, two international issues can be highlighted as central to the achievement of sustainable development goals. The first is whether it is politically possible to combine the pursuit of increased wealth and development by national societies (most of whose members have strong preferences for minimal constraints on their consumption levels) with a respect for the ecological and material limits of the biosphere. To realize this possibility, international and national policies and

agreements are needed to ensure that the needs of future generations, as well those of the present, are considered. The second is whether the international development system can become far more effective at ensuring people's needs are met (and building local capacities to ensure they are met), especially in low-income nations. Both require more competent, effective city and municipal governments. It is time the debates about sustainable development (and sustainable cities) gave more attention to this.

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LITERATURE CITED

1. Rees WE. 1995. Achieving sustainability: reform or transformation? *J. Plan. Lit.* 9(4):343–61

2. Satterthwaite D. 2002. *Coping With Rapid Urban Growth*. London: R. Inst. Chart. Surv. 35 pp.

3. UN Popul. Div. 2002. *World Urbanization Prospects: The 2001 Revision*. New York: UN Dep. Econ. Soc. Aff., ST/ESA/SER.A/216. 321 pp.

4. Graumann JV. 1977. Orders of magnitude of the world's urban and rural population in history. *UN Popul. Bull.* 8:16–33

5. UN Cent. Hum. Settl. (Habitat). 1996. *An Urbanizing World: Global Report on Human Settlements, 1996*. Oxford: Oxford Univ. Press. 559 pp.

6. Hardoy JE, Mitlin D, Satterthwaite D. 2001. *Environmental Problems in an Urbanizing World: Finding Solutions for Cities in Africa, Asia and Latin America*. London: Earthscan. 470 pp.

7. UN Habitat. 2003. *Water and Sanitation in the World's Cities*. London: Earthscan. 274 pp.

8. Garza G. 2002. *Urbanisation of Mexico during the twentieth century*. Urban Change Work. Pap. 7, Int. Inst. Environ. Dev., London

9. UN Popul. Div. 1975. *Trends and Prospects in the Population of Urban Agglomerations as assessed in 1973–75*. ESA/P/WP.58 New York: UN Dep. Int. Econ. Soc. Aff.

10. Brown L. 1974. *In the Human Interest*. New York: Norton

11. Potts D. 2001 . *Urban growth and urban economies in eastern and southern Africa: an overview*. Presented at Workshop Afr. Urban Econ.: Viability Vitality Vitiation Major Cities East South. Afr., Nov. Neth.

12. Sassen S. 2002. Locating cities on global circuits. *Environ. Urban.* 14(1):13–30

13. World Bank. 2003. *Global Development Finance 2003*. Table A 19, Stat. Annex, p. 198. Washington, DC: World Bank

14. World Comm. Environ. Dev. 1987. *Our Common Future*. Oxford: Oxford Univ. Press. 383 pp.

15. Newman P. 1996. Reducing automobile dependence *Environ. Urban.* 8(1):67–92

16. World Health Organ. 1999. Creating healthy cities in the 21st century. Chapter 6. In *The Earthscan Reader on Sustainable Cities*, ed. D Satterthwaite, pp. 137–72. London: Earthscan

17. Wratten E. 1995. Conceptualizing urban poverty. *Environ. Urban.* 7(1):11–36

18. World Health Organ. 1992. *Our planet our health*. Rep. Comm. Health Environ. Geneva 282 pp.

19. Hardoy JE, Satterthwaite D. 1989. *Squatter Citizen: Life in the Urban Third World*. London: Earthscan. 388 pp.

20. Satterthwaite D, Taneja B. 2003. *Agriculture and urban development*. Presented at World Bank, Washington, DC, 28 pp.

http://www.worldbank.org/urban/urbanrural seminar/

21. Hardoy JE, Satterthwaite D. 1988. Small and intermediate urban centres in the Third World; what role for government? *Third World Plan. Rev.* 10(1):5–26

22. Tacoli T. 1998. *Bridging the divide: rural-urban interactions and livelihood strategies*. Gatekeeper Ser. 77. Int. Inst. Environ. Dev., Sustain. Agric. Rural Livelihoods Programme, London. 17 pp.

23. Eaton D, Hilhorst T. 2003. Opportunities for managing solid waste flows in the peri-urban interface of Bamako and Ouagadougou. *Environ. Urban.* 15(1):53–64

24. Smit J, Ratta A, Nasr J. 1996. *Urban Agriculture: Food Jobs and Sustainable Cities.* Publ. Ser. Habitat II, Vol. 1. New York: UN Dev. Programme. 302 pp.

25. Mayers J, Bass S. 1999. *Policy That Works for Forests and People*. London: Int. Inst. Environ. Dev. 324 pp.

26. Rietbergen S. 1989. Africa. In *No Timber Without Trees*, ed. D Poore, pp. 40–73. London: Earthscan

27. Bhatt CP. 1990. The Chipko Andolan: forest conservation based on people's power. *Environ. Urban.* 2(1):7–18

28. Leach G, Mearns R. 1989. *Beyond the Woodfuel Crisis: People, Land and Trees in Africa.* London: Earthscan. 309 pp.

29. White R. 1992. The international transfer of urban technology: Does the North have anything to offer for the global environmental crisis? *Environ. Urban.* 4(2):109–20

30. Connolly P. 1999. Mexico City: our common future? *Environ. Urban.* 11(1):53–78

31. Rees WE. 1992. Ecological footprints and appropriated carrying capacity: what urban economics leaves out. *Environ. Urban.* 4(2):121–30

32. Wackernagel M, Rees WE. 1995. *Our Ecological Footprint: Reducing Human Impact on the Earth.* Gabriola Isl., Can.: New Society. 176 pp.

33. McGranahan G, Jacobi P, Songsore J, Surjadi C, Kjellén M. 2001. *Citizens at Risk: From Urban Sanitation to Sustainable Cities.* London: Earthscan

34. Jopling J, Girardet H. 1996. *Creating a Sustainable London.* London: Sustain. London Trust. 45 pp.

35. World Bank. 1999. *Entering the 21st Century: World Development Report 1999/2000*. Oxford/New York: Oxford Univ. Press. 300 pp.

36. Newman P, Kenworthy J. 1999. *Sustainability and Cities: Overcoming Automobile Dependence*. Washington, DC: Island. 442 pp.

37. World Resourc. Inst. 2000. *World Resources 2000–2001: People and Ecosystems: the Fraying Web of Life*. Table AC.1. Washington, DC: World Resourc. Inst.

38. Nishioka S, Noriguchi Y, Yamamura S. 1990. Megalopolis and climate change: the case of Tokyo. In *Cities and Global Climate Change*, ed. J McCulloch, pp. 108–33. Washington, DC: Clim. Inst.

39. Agarwal A, Narain S, Sen S, eds. 1999. *State of India's Environment: The Citizens' Fifth Report.* New Delhi: Cent. Sci. Environ. 300 pp.

40. UN Environ. Programme. 1991. *Environmental Data Report, 1991–2*, GEMS Monit. Assess. Res. Cent. Oxford: Blackwell. 408 pp.

41. Satterthwaite D. 1997. Sustainable cities or cities that contribute to sustainable development. *Urban Stud.* 34(10):1667–91

42. Scott M, Gupta S, Jáuregui E, Nwafor J, Satterthwaite D, et al. 2001. Human settlements, energy and industry. In *Climate Change 2001; Impacts, Adaptation, and Vulnerability*, ed. JJ McCarthy, OF Canziani, NA Leary, DJ Dokken, KS White, pp. 381–416. Cambridge: Cambridge Univ. Press

43. Haughton G. 1998. Environmental justice and the sustainable city. *J. Plan. Edu. Res.* 18(3):233–43

44. Von Weizsäcker E, Lovins AB, Lovins LH. 1997. *Factor Four: Doubling Wealth,*

Halving Resource Use. London: Earthscan. 322 pp.

45. Velasquez LS. 1998. Agenda 21; a form of joint environmental management in Manizales, Colombia. *Environ. Urban.* 10(2):9–36

46. Miranda L, Hordijk M. 1998. Let us build cities for life: the national campaign of local Agenda 21s in Peru. *Environ. Urban.* 10(2):69–102

47. Menegat R. 2002. Participatory democracy and sustainable development: integrated urban environmental management in Porto Alegre, Brazil. *Environ. Urban.* 14(2):181–206

48. Rabinovitch J. 1992. Curitiba: towards sustainable urban development. *Environ. Urban.* 4(2):62–77

49. Gleick PH. 2003. Water use. *Annu. Rev. Environ. Resour.* 28:275–314

50. McGranahan G, Satterthwaite D. 2000. Environmental health or ecological sustainability? Reconciling the brown and green agendas in urban development. In *Sustainable Cities in Developing Countries*, ed. Cedric Pugh, pp. 73–90. London: Earthscan

51. McGranahan G. 2002. *Demand-Side Water Strategies and the Urban Poor.* PIE Ser. 4 London: Int. Inst. Environ. Dev. 67 pp.

52. Hasan A. 1997. *Working with Government: The Story of the Orangi Pilot Project's Collaboration with State Agencies for Replicating its Low Cost Sanitation Programme*. Karachi: City Press. 269 pp.

53. Mangin W. 1967. Latin American squatter settlements; a problem and a solution. *Latin Am. Res. Rev.* 2(3):65–98

54. Turner JFC. 1969. Uncontrolled urban settlements: problems and policies. In *The City in Newly Developed Countries*, ed. G Breese, pp. 507–34. New Jersey: Prentice Hall

55. Stren RE. 1989. Administration of urban services. In *African Cities in Crisis*, ed. RE Stren, RR White, pp. 37–67. Boulder: Westview

56. Satterthwaite D. 2001. Reducing urban poverty: constraints on the effectiveness of aid agencies and development banks and some suggestions for change. *Environ. Urban.* 13(1):137–57

57. Dep. Environ. Food Rural Aff. 2003. *Consumer Products: The European Ecolabel*. http://www.defra.gov.uk/environment/consumerprod/ecolabel/

58. Fairtrade Found. 2003. *Why Fairtrade?* http://www.fairtrade.org.uk

59. Gap Inc. 2003. *Beyond the Label: Gap Inc.'s Commitment to Ethical Sourcing.* http://www.gapinc.com/social_resp/sourcing_body.shtm

60. Foronda ME. 1998. Chimbote's Local Agenda 21: initiatives to support its development and implementation. *Environ. Urban.* 10(2):129–47