PART IV

DEVELOPMENTS IN THE URBAN ENVIRONMENT AND INFRASTRUCTURE

Earlier parts of this report noted that current economic globalization is dominated by the logic of market mechanisms. The argument was developed that markets can be effective for some purposes but that they do not perform well in other situations. For example, they tend not to be effective in guaranteeing universal access to public goods. Among these public goods are the urban environment and infrastructure. Inadequate regulation permits environmental degradation and engenders unequal access to services to meet basic needs. The solution is not to centralize responsibilities for environmental management and infrastructure development in government. What is needed is the development of broad-based partnerships that comprise not only the public and private sectors, but also civil society and in particular low-income communities. There is a growing number of examples of such partnerships that attest to the potential of this cooperative approach in redressing environmental problems, deficient urban infrastructure and inadequate service provision.

Official statistics greatly overstate the extent to which urban populations are served with safe water and adequate sanitation. Among those classified as 'adequately served' are the inhabitants of settlements where hundreds of people have to share a single standpipe and others who have access to standpipes that are poorly maintained or contain contaminated water. The burden of hauling water disproportionately falls on women, and evidence indicates that this task has become more arduous. Likewise, households are counted as having adequate sanitation if they share access to a public latrine, even if it is shared with 100 or more people and when maintenance and cleaning is so poor that using the latrine is a major health hazard and people avoid using it.

These conditions are especially worrisome in cities where they help to spread easily preventable diseases that affect particularly women and children. Research shows very large income-based differences in mortality and morbidity rates related to unequal access to piped water and adequate sanitation. Improvement requires policies that integrate human settlement programmes with programmes that bridge the provision of safe water, the collection and disposal of human excreta and hygiene education.

Inequalities are also evident in urban energy consumption where they are becoming a source of economic and political tension. The wealthiest 20 per cent of the world's population consumes 68 per cent of the world's commercial energy, whereas the lowest quintile uses less than 2 per cent. In recent decades, the developing economies have been transferring energy resources to the more developed economies at an increasing rate. Per capita energy usage in the US is more than five times the global average. Car-dependent cities have particularly high levels of energy consumption and associated pollution problems. Worldwide, more than 1 thousand million people are estimated to live in urban settlements where air pollution levels exceed health

standards. Low-income communities are disproportionately located in proximity to pollution generated by energy plants and road traffic.

Needed policies must promote public transit and non-motorized forms of transport and must substantially reduce the massive subsidies for conventional fossil fuel and nuclear power, which benefit large industrial producers and consumers, rather than people living in poverty. In many metropolitan areas, Agenda 21 and other coalitions are spearheading energy reforms. It is only when local civil society and business interests participate in developing and implementing these innovative agendas that efforts to achieve sustainability can succeed.

Recent experience shows that the shift in responsibility for service provision and management of infrastructure to the local level is not always supported by a commensurate transfer of resources and authority to develop the requisite tax base. The implications have been serious deficiencies, total system collapse and loss of physical assets as a result of overload and insufficient maintenance. The success of decentralization depends greatly on the ability of central government to institute an appropriate regulatory framework for central–local relationships and its willingness to provide localities with assets and intergovernmental transfers rather than budget allocations.

Democratic local governance is essential if decentralization of infrastructure management is to be effective. Recognizing the empowering role of infrastructure, micro-finance institutions and community-based organizations have initiated programmes that provide low-income households with access to land and needed services to improve their earnings capacity and living conditions. Urban policies and international development agencies should be directed to support these initiatives.

CHAPTER 9

URBAN HEALTH IN THE DEVELOPING COUNTRIES[1]

Globalization has affected human health in complex ways with positive as well as negative implications. Through trade and military conquest, native populations were exposed to communicable diseases previously unknown to them, sometimes intentionally, which in some regions decimated the autochthonous inhabitants.[2] The HIV/AIDS pandemic is a contemporary example with particularly devastating effects on the economies, communities and households in sub-Saharan Africa. In a different vein, the global expansion of a consumerist culture has brought with it an increase in lifestyle-related diseases and industrial pollution, while chemical contamination associated with agricultural mass production, and toxic waste dumping have had worldwide health impacts. On the other hand, globalization has made possible the spread of medical and pharmaceutical advances, leading to the eradication of some diseases and the diminished incidence of others. Likewise, there have been widespread gains in food production as a result of the development of more disease-resistant and more nutritious strains, and tele-medicine has made available diagnostic tools previously unavailable in remote areas. To be sure, these benefits have not been equally shared; however, the reasons for this inequality are political and economic, rather than inherent in globalization. Finally, also in association with globalization, new organizations and programmes have been established whose missions of health promotion are explicitly international in scope. A good example in the context of human settlements is the Healthy Cities Programme of the World Health Organization.[3]

The focus in this chapter is on human health in the developing countries and, within this context, the discussion concentrates on cities. This orientation is in keeping with the continuing urbanization in these countries, but it is not to negate the importance of health issues in rural areas; indeed, as noted in the conclusion of this chapter, the two are often linked.

When considering urban health patterns it is useful to distinguish four phenomena. First, urban health patterns are different from those in rural areas because urban populations are leading the 'epidemiological transition': a shift from communicable to non-communicable diseases. Second, there are still some communicable health problems that dominate in urban areas (eg HIV/AIDS), particularly among children (eg infectious respiratory diseases). Third, low-income urban populations suffer the 'worst of both worlds' in terms of both communicable and non-communicable diseases. Fourth, the health burden of the urban poor can only be fully understood in terms of inequity within the city as a whole. These four issues are dealt with in turn below.

Urban Populations Lead the Health Transition

Empirical evidence from the Americas indicates that the 'epidemiological transition' is taking place fastest in countries with the highest levels of urbanization, and that the transition generally occurs first in urban areas.[4] This pattern is supported by studies in other developing countries that demonstrate higher rates of malaria, malnutrition, maternal mortality and respiratory diseases in rural compared with urban populations,[5] and higher risk factors for and rates of diabetes, cardiovascular disease, cancers, coronary heart disease and accidents in urban areas.[6]

By the third decade of this century, depression, traffic accidents and heart disease are predicted to become the leading disease burdens in developing countries, as opposed to respiratory disease, diarrhoea and perinatal conditions at present

The reasons for the differences in rural and urban health profiles are complex and relate to dramatic environmental, socio-economic and cultural changes brought about by urbanization. Interrelated factors such as relatively low fertility rates, better immunization coverage and better access to and 'appropriate' use of health facilities in urban areas have contributed to a decrease in communicable diseases and a concomitant child survival advantage associated with urban compared with rural residence.[7] Non-communicable diseases (including 'diseases of affluence') and diseases associated with social instability, have therefore gained in relative importance, particularly among urban adults.[8] The dramatic and growing impact that mental ill-health, violence, accidents and chronic disease will have on developing countries is illustrated in disability adjusted life year (DALY) predictions. By the third decade of this century, depression, traffic accidents and heart disease are predicted to become the leading disease burdens in developing countries, as opposed to respiratory disease, diarrhoea and perinatal conditions, which are leading at present.[9]

A growing body of empirical work over the 1990s has contributed to and supported these predictions, and demonstrated their importance as emerging urban health issues. Work on injuries, mental ill-health and 'lifestyle' diseases is particularly illuminating and is considered below.

Injuries

Violence is a major cause of injuries. Much of the empirical work on violence has been carried out in the world's most violent region: Latin America and the Caribbean. Latin America has the world's highest burden of homicides, at a rate of 7.7 per 1000 individuals, compared with the world average of 3.5 per 1000. Approximately 30 per cent of all homicides are among adolescents between 10 and 19 years old, and males are the most affected.[10] Violent crime is particularly prevalent in the regions' large cities, and within them, among men living in low-income urban areas.[11]

Analysis of data collected between 1991 and 1993 in São Paulo, Brazil, showed that males aged 15–24 living in low-income areas were over five times as likely to become victims of homicide compared with their counterparts resident in higher-income areas.[12] Higher rates of homicide in low-income areas are the outcome of multiple factors:

> *'concentrated poverty, urban deterioration, racism and other forms of social discrimination, lack of opportunities of employment and formal education, lack of policing … emphasis on violent behaviour as a way of resolving personal conflicts … easy access to fire-arms, the increasing consumption of drugs (such as crack and marijuana) and alcohol abuse… The correlation between living conditions and structural violence [violence arising from a social system that produces gender, race and age discrimination, as well as inequalities of social class] is not a linear or mechanical relation… [Also involved are] cultural traits and aspects of personal relationships in some segments in the population.'*[13]

Traffic accidents are another major cause of death and injury in cities and towns.[14] Causes of motor vehicle crashes are many, but necessarily involve the interaction of three pre-crash factors: people, vehicles and the road environment.[15] The higher density of each of these in urban areas puts urban populations at greater risk than rural populations. Although this has been supported with empirical data,[16] higher rates – at least of injuries – have also been found in rural areas.[17] Furthermore, research in Latin America and the Caribbean has documented a strong negative correlation between the number of vehicles per 1000 persons and the death rate per 100,000 vehicles.[18] Broader factors influencing the rate of traffic accidents are alcohol consumption, a country's capabilities to invest in roads, legislation and control. According to a recent report, the fatality rate on South African roads fluctuated around 11 persons killed per 100 million vehicle miles. This rate is lower than that of some other African countries, but compares unfavourably with, for example, Zimbabwe (3.3) and Zambia (3.0) as well as the US (1.1) and Australia (1.8). More than 40 per cent of the fatalities were pedestrians.[19] A recent review of research on road traffic injuries in developing countries found that casualty rates per 10,000 varied widely, from 3.0 in Saudi Arabia to 301.9 in Haiti.[20] In all 73 studies, rates were at least twice as high among men than women; the outcome of greater exposure and possibly – to a lesser extent – behaviour. Adolescents and young adults are particularly high-risk groups. Of interest for urban planners is that traffic-related injuries account for between 30 and 86 per cent of all trauma admissions (15 studies), with the mean length of stay 20 days (11 studies). Given that the majority of trauma facilities are located in urban areas, these statistics suggest that accidents not only pose an enormous mortality and morbidity risk to urban residents, they also are a significant burden on urban health systems.

Accidents other than those involving traffic have been less carefully documented, but include accidental falls, drowning, poisoning and fire. Some unintentional injuries are more common in urban areas because of factors such as overcrowding.[21] Although precise statistics are not available, it is known that what passes for a domestic accident is, in reality, often an instance of spousal abuse; a fact that throws women's disproportionate health risks into further relief.

Mental ill-health

By 2020, depression is predicted to become the leading disease burden in developing countries. Community-based studies of mental health in urban areas of developing countries have documented prevalence rates of between 12 and 51 per cent.[22] Prevalence of anxiety and depression is typically higher among women than men, and among lower-income communities, with variations reflecting differential exposure and vulnerability to diverse risk factors, including control over resources, marriage patterns, cultural ideology, long-term chronic stress, exposure to stressful life events, coping strategies and social support.[23] Social support – 'the degree to which a person's basic social needs are gratified through interaction with others' – has been estimated to account for between 5 and 10 per cent of variance.

The chronic stress of poverty and stressful life-events can have very negative direct and indirect effects on physical and mental health

Emotional support (love, empathy, companionship) and practical support (goods, services, information) are key resources drawn upon to cope with or to 'buffer' the potential mental (and physical) health effects of chronic or short-term stress.[24] Urban environments, and low-income urban environments in particular, are characterized by harsh physical and social environments, poor-quality housing and service provision and reduced employment and income generation potential.[25] Day-to-day life in these contexts can amount to chronic stress. The strategies that low-income households employ to cope with such stresses

are numerous, including working longer hours, depending more heavily on women's earning capacities, deploying children into income-generating activities, fostering out children to rural relatives (and adopting other forms of multi-location households), circular or permanent migration by household members for employment, exploring new niches in the informal sector and maximizing the use of the meagre resources available. These strategies point to the creativity and resilience of low-income groups. Nevertheless, the chronic stress of poverty and stressful life-events can have very negative direct and indirect effects on physical and mental health. Urbanization has also been associated with a reduction in social support linked to the breakdown (or at least reorganization) of extended families, increase in single parent households, reduced fertility and participation in work outside the home.[26] Clearly this has implications for the coping strategies themselves, and for physical and psychological well-being.

Current knowledge gaps concern the interrelationships of mental illness with social support, and with community-level factors such as high levels of violence or low levels of social cohesion.[27] Regarding the latter, an ecological variable that may play a role is social capital, or 'the density and nature of the network of contacts or connections amongst individuals in a given community'. Strong social capital has been linked with reduced mortality at the state level in the US. As the coping ability of low-income urban households decreases and community trust breaks down, social capital weakens; it is also eroded by violence (see Chapter 17).[28]

Chronic or 'lifestyle' diseases

Chronic or 'lifestyle' diseases such as heart problems and cancers will become an increasingly heavy health burden in developing countries. Risk factors include potentially toxic emissions such as carbon dioxide, sulphur dioxide, nitrogen oxides and suspended particulate matter, and lifestyle factors such as increased smoking, alcohol consumption, increased fat intake, reduced fibre intake and reduced exercise. Risk factors for and rates of diabetes, obesity, cardiovascular disease, cancers and coronary heart disease have been documented to be higher in urban than in rural areas. Research has amply documented that sources of pollution are disproportionately located near low-income communities and minorities,[29] raising questions of environmental justice that are also in evidence at the global level. In this connection, the Basel Action Network (BAN) is a global network of individuals and non-governmental, non-commercial organizations working to stop the globalization of the toxic chemical waste crisis and to support ratification of the Basel Convention, which bans the export of hazardous wastes from OECD countries to the developing countries.[30] People living in poverty are also more exposed to toxic and hazardous environments in their daily work activities, dramatically illustrated by the lives (and deaths) of the scavengers in the Payatas community in the Philippines.[31]

In Latin America, there is an upward trend in specific types of mortality, such as cancer of the lung, gall-bladder and breast.[32] Circulatory disease is the second most important cause of death among 15–44-year-olds in Accra, Ghana, and São Paulo, Brazil, and the principal cause of death of 45–64-year-olds.[33] Community-based studies among the elderly have also documented high rates of mortality and morbidity due to chronic and lifestyle diseases.[34] These diseases are primarily adult health problems, and the changing demographic structure, as well as prevalence and increase of risk factors in urban populations support the DALY predictions that they will become increasingly important sources of mortality.

Emerging Evidence of an Urban Penalty?

The term 'urban penalty' or 'le handicap urbain' was prompted by analysis of mortality data in England from the Industrial Revolution of the 19th century, which revealed that urban mortality rates (particularly from tuberculosis) were much higher than rural rates.[35] In continental Europe, at the same time, infant gastrointestinal disease accounted, for example, for one-third of all deaths in Prussian urban communities in 1887.[36] Rural–urban differences were stark. In 1875, the infant mortality rate (IMR) in rural Prussia was 190 compared with 240 in urban areas.[37] Public health measures such as supply of clean water and sanitation plus socio-economic changes led to a decline in urban IMRs after around 1893.[38]

Since 1970, infant mortality rates in sub-Saharan cities have increased

Recent analysis of urban demographic and health survey (DHS) data from 43 countries has demonstrated a much slower decline since the 1970s in levels of early mortality of residents in large cities than in those in smaller towns and villages in all regions of the developing world (with the exception of Southeast Asia). It is particularly disturbing that infant mortality rates had actually risen substantially in small and medium-sized cities in sub-Saharan Africa, in many cases including the capital city.[40]

In addition to sustained recession, persistent urban growth, deteriorating physical environments and strained management capabilities, the HIV/AIDS epidemic is contributing to the sub-Saharan African urban penalty. There is substantial evidence of higher HIV prevalence in large urban areas compared with smaller urban and rural areas.[41]

The current narrowing of rural and urban child health differentials, in Africa and elsewhere, is more likely to be the outcome of changes in patterns of traditional diseases of poverty rather than emerging epidemics. Regarding food security and malnutrition, for example, in 12 out of 16 countries of the WHO Global Database on Child Growth and Malnutrition, the absolute number of underweight children in urban areas is increasing, and at a faster rate than in rural areas. As noted in Chapter 1, the locus of malnutrition is shifting from rural to urban areas.[42]

Given the well-known synergies between malnutrition and infectious disease,[43] and evidence of growing poverty, inequity and environmental degradation within urban communities, this pattern is reflected in other 'diseases of poverty'. The next chapter of this report details the health risks resulting from lack of access to safe water and adequate sanitation, burdens that are borne first and foremost by the poor and, among them, women, children, and the elderly.

Despite major advances in reducing communicable diseases in the cities of developing countries, such diseases continue to be a major cause of mortality

A plethora of studies over the 1990s have demonstrated that despite major advances in reducing communicable diseases in developing countries, and particularly in urban areas, such diseases continue to be a major cause of urban mortality. The burden is particularly heavy for young children. For example, infectious and parasitic diseases are the main cause of death for under-15-year-olds in Accra, Ghana.[44] In São Paulo, Brazil, respiratory diseases are the chief cause of death in under-five-year-olds, while infectious diseases are the second most important cause of death. Child mortality due to communicable disease is significantly higher in more deprived areas in both cities.

Studies of low-income urban communities demonstrate the importance of preventing neonatal death, diarrhoea, non-specific fever, malaria, acute respiratory infection (ARI), tuberculosis (TB) and measles to reduce child mortality and morbidity.[45] Significant associations between these diseases, and with HIV infection, have also been documented. The interaction of multiple risk factors in an urban environment is illustrated by those factors associated with acute respiratory infection:

> *'Acute respiratory infections tend to be endemic rather than epidemic, affect younger groups, and are more prevalent in urban than in rural areas. The frequency of contact, the density of the population and the concentration and proximity of infective and susceptible people in an urban population promote the transmission of the infective organisms. Poor groups … are much more at risk because of the greater proportion of younger age groups, limited health and financial resources, and over-crowded households in congested settlements with limited access to vaccines and antibacterial drugs. The constant influx of migrants susceptible to infection and possible carriers of the new virulent strains of infective agents, together with the inevitable increase in household numbers, foster the transfer of nasopharyngeal microorganisms.'*[46]

Non-communicable diseases gain in relative importance as urban populations age. But communicable diseases continue to be an important cause of adult mortality. In Dar es Salaam, Tanzania, HIV is the primary cause of death among urban males, and HIV and maternal mortality are the primary killers of urban women.[47] Noteworthy in this rural–urban comparison, 10.8 per cent and 19.2 per cent of the adult deaths recorded in the two rural study sites were urban residents who had returned to the rural area after becoming ill. This pattern of return urban–rural migration of sick adults is a common characteristic in developing world regions where rural–urban ties are maintained, and may lead to underestimates of adult mortality rates in urban community surveys.

Before the HIV/AIDS epidemic, TB was the leading cause of death among adults in developing countries, killing an estimated 3 million people in 1995.[48] The interaction between HIV and TB, and the spread of multi-drug-resistant strains of TB, has increased concerns about a global resurgence of TB. Given that socio-environmental conditions (particularly high levels of crowding) are risk factors for TB,[49] and that there is higher prevalence of HIV in many urban populations, TB will become increasingly prevalent in many urban areas. High-density, low-income populations are particularly at risk. The socio-environmental conditions in these areas have also led to the emergence or re-emergence of vector-borne diseases, including malaria, filariasis, dengue, Chagas' disease, plague and typhus.[50]

Low-income Urban Populations: The Worst of Both Worlds?

Is an urban penalty a risk for entire urban populations, or only for a specific sub-population? More precisely, does evidence suggest 'a penalty for the urban poor' rather than an urban penalty? A principal contribution of the last major urban health review[51] was to bring together studies highlighting intra-urban inequities in morbidity and mortality in developing countries.[52] Together, these studies suggested that the urban poor suffer the 'worst of both worlds': a 'double burden' of both 'old' and 'new' epidemiological profiles. Much of the research reviewed above demonstrates the high burdens of disease suffered by low-income populations and therefore supports the hypothesis. However, more systematic explorations into intra-urban health differentials are necessary to answer the question. This gap has recently been filled by research on urban nutrition by the International Food Policy Research Institute (IFPRI).[53]

DHS data from 11 developing countries show that the ratio of stunting prevalence between poorer vs. wealthier quintiles is greater within urban than within rural areas, and that intra-urban differences (between socio-economic groups) are greater than urban/rural differentials. Urban poor households have worse nutritional status than rural poor households, contributing to greater ill-health related to nutrition. Malnourishment, hunger, dietary excess and obesity often co-exist in urban populations. FAO 1999 data for 133 low-income countries show that more urbanized countries have a higher consumption of sweeteners and fats:

> *'a shift from 25 per cent to 75 per cent urban population in very low income countries is associated with an increase of approximately four percentage points of total energy from*

fat and an additional 12 percentage points of energy from sweeteners'.[54]

Although this pattern is often considered to apply only for the urban rich, research in urban Brazil and South Africa has found that the more educated are less likely to be overweight than the less educated.[55]

Additional analysis of DHS data found socio-economic status, short birth intervals, young maternal age, parental education and in-migration of mothers from rural areas powerful predictors of infant survival in cities with populations of over 1 million.[56] Possible explanatory factors include the threat of new infectious disease agents, temporary residence in particularly poor housing environments on arrival, changes in care-giving practices, a termination of breastfeeding, a decrease in income and incomplete immunization due to lack of familiarity with services. Overwhelming empirical evidence from all developing regions now links poor housing conditions in urban areas to childhood disease and injuries.[57]

Particularly insidious is Chagas' disease (American trypanosomiasis), a parasitic infection that afflicts between 18 and 20 million people in Mexico, Central and South America. It leads to an estimated 50,000 fatalities annually and debilitates many more, making it the leading cause of death just after ARIs, diarrhoeal diseases and HIV/AIDS. Although the disease is also passed on through blood transfusions and breastfeeding, its main vectors are nocturnal beetles (*Triatoma reduvii* and *Rhodnius prolixus*) whose bites transmit a parasite (*Trypanosoma cruzi*). These beetles breed in cracks in the walls of homes, in thatched roofs and in spaces between wooden boards. They thrive in dark, poorly ventilated, humid environments. Currently, there is no cure and attempts to control the disease involve preventive measures. Fumigation is temporarily effective but long-term intervention requires home improvements, using locally available, low-cost materials. Education is important as well. Because the disease is often asymptomatic for 15–20 years and mainly affects poor people with more immediate survival concerns, awareness-raising efforts must accompany schemes aimed at upgrading the housing environment.[58]

A key message is that disposable household income and the way it is spent are not the sole or even most important determinants of the health of urban children, which is affected significantly by their wider social and physical environment

Studies of 0–15-year-olds in Ghana, Brazil, Egypt and Thailand found major socio-economic disparities in health and mortality within the urban sector of all four countries. The differences reflect the interrelated effects of socio-economic status, access to health services and environmental conditions. The relative importance of each, and the size of intra-urban differentials in child health, are related to overall national income and the particular histories of economic and urban development of each country. A key message therefore is that disposable household income and the way it is spent are not the sole or even most important determinants of the health of urban children, which is more significantly affected by their wider social and physical environment.

An influential analysis of routinely collected urban data on socio-economic status, indicators of environmental quality and mortality from Accra, Ghana, and São Paulo, Brazil, has demonstrated enormous disparities between the health status of urban populations living in the most deprived areas compared with the least deprived areas.[59] The most deprived areas not only suffer relatively high mortality rates due to diseases of the respiratory system, and infectious and parasitic disease, but also due to diseases of the circulatory system. In São Paulo, deaths due to external causes (homicides and traffic accidents) were three times higher in the most deprived compared to the least deprived areas. Figures for homicide were particularly striking in São Paulo: there was an 11-fold mortality differential between rich and poor neighbourhoods. With a similar socio-economic and environmental profile, 55 per cent of the deaths in the most deprived zones could have been prevented. In Accra, adult mortality in the poorest three zones was 67 per cent higher than in the city's best areas.[60] The research on environmental urban health inequalities in Accra, São Paulo and Jakarta is summarized in Box 9.1.

The work on intra-urban inequalities highlights the diverse experience in different countries and communities, but in general provides evidence that the urban poor die disproportionately of both infectious and chronic degenerative diseases. Extant research also underlines the importance of disaggregating urban data *within* cities by gender, income and age.

Box 9.1 Environmental health inequalities in Accra, Jakarta and São Paulo

It is often assumed that the worst physical environments are in megacities where it may be difficult for even the affluent to avoid the worst environmental hazards: industries and transport systems pollute the ambient air that most residents breath as well as other public environments. But many of the most serious environmental health hazards are in people's homes and workplaces. Here the patterns of inequality are different, and relate more closely to poverty than to city-size and industrialization. Illustrative patterns of inequality at the household level are provided in Tables 9.1 and 9.2 and are based on representative surveys of 1000 households in Jakarta and São Paulo, coordinated by the Stockholm Environment Institute.

In Accra, the smallest and poorest of the three cities, by far the highest share of households are exposed to what could be considered health-threatening living environments. Jakarta, in turn, has a higher share than São Paulo, the largest and most affluent city (Table 9.1). However, there are also appreciable inequalities within Accra where some of the most significant differences arise among poor households and neighbourhoods (Table 9.2). Table 9.3 relates environmental health risk factors to child diarrhoea. Among households facing two or less of these risk factors, only 2 per cent reported diarrhoea incidents, among those facing three or four risk factors the percentage rose to 14, and among those facing more than four risk factors the percentage rose to 39. Generally, the deeper in poverty, the more risk factors a household faces. Children's health (indicated by both diarrhoea and acute respiratory infections) is clearly affected by the environmental correlates of poverty. Whether the children were girls or boys was not found to be significant. However, the respiratory health of women is related to risk factors associated with their gender roles, such as cooking food and spraying for insects.

Source: McGranahan et al, 1999; Jacobi, 1999; Surjadi et al, 1994.

Environmental health indicator	Accra	Jakarta	São Paulo
Water: no water source at residence (%)	46	13	5
Sanitation: share toilets with > 10 households (%)	48	13	3
Solid waste: no home garbage collection (%)	89	37	5
Indoor air: main cooking fuel wood or charcoal (%)	76	2	0
Pests: flies in kitchen (%)	82[i]	38[i]	20[ii]
Number of households	1000	1055	1000

Notes: i As observed by interviewer. ii As perceived by respondent.
Sources: McGranahan et al, 1999; Jacobi, 1999; Surjadi et al, 1994.

Table 9.1
Household environmental indicators in Accra, Jakarta and São Paulo

Shifting the Focus from the Urban Poor to Urban Inequity

Studies reveal enormous intra-urban inequity in housing conditions, income earned, sanitation, drainage, piped water, environment, access to services, morbidity and mortality

Much of the research attention in urban health continues to be directed towards the urban poor rather than on intra-urban inequities. However, studies reveal enormous intra-urban inequity in housing conditions, income earned, sanitation, drainage, piped water, environment, access to services and morbidity and mortality.[61] These disparities, and particularly those supporting the double burden of communicable and non-communicable disease faced by low-income urban groups, could be used to support a continued focus on the urban poor. However, these findings could equally justify a shift in attention away from the urban poor in isolation towards *relative* poverty and *whole* urban populations. Box 9.2 dramatically highlights the interrelatedness of low- and high-income groups, the importance of psycho-social forces in the mental and physical health of low-income groups and, ultimately, of all urban residents.

The fallacy of focusing on the urban poor as opposed to inequity is that individuals and households come to be perceived as the ones to solve problems, rather than a societal responsibility to alleviate poverty

The fallacy of focusing on the urban poor as opposed to inequity is that individuals and households come to be perceived as the ones to solve problems, rather than a societal responsibility to alleviate poverty. It leads to descriptions of physical and socio-economic deprivation and how this affects health, rather than focusing on the mechanisms that have brought about and maintain such deprivation.[62] Intra-urban analysis of wealth and health suggests the opposite: it places the importance of governance, municipal management and the genuine empowerment of low-income communities at the centre of urban health:

> *'In many instances, it is not people's poverty which drives the illness but the incapacity or unwillingness of government institutions to provide them with the means to prevent ill health – in part through basic services. This in turn is related to unrepresentative political structures where the poor majority have little power and influence over public actions … it is the poor's lack of influence on government policies and institutions and their lack of protection from the law that explain a significant part of the deprivation they face … [and] … governments will not address urban poverty and its underlying causes unless the poor have more political influence.'*[63]

This shift towards intra-urban inequalities in health, and towards the empowerment of low-income groups through socio-political change, is also supported by analysis of historical data from the UK. What was important in determining the changing relationship between economic growth and health was poorer sections of the community having an effective political voice. And having an effective political voice required more than voting rights: the leadership, the relationship of the poor with elements of other, more privileged, social groups, and the latter's ideologies were the critical factors in determining the consequences of voting.

Table 9.2
Household environmental indicators in Accra, by affluence of neighbourhood

Environmental health indicator	Poor	Middle class	Affluent
Water: no water source at residence (%)	55	14	4
Sanitation: share toilets with > 10 households (%)	60	17	2
Solid waste: no home garbage collection (%)	94	77	55
Indoor air: main cooking fuel wood or charcoal (%)	85	44	30
Pests: flies in kitchen (%)	91	56	18
Number of households	790	56	18

Source: Benneh et al, 1993.

Beyond the Rural–Urban Divide

The complex picture of urban health presented in the previous sections is matched by a complex array of health-care providers. The urban health 'system' is increasingly pluralistic with traditional practitioners, central and local government facilities, NGOs, private for-profit practitioners, telemedicine and retail outlets for self-medication. Increasing quality of care within and coordination between this array of providers in the urban scene is a priority of researchers and governments, but there are few models to use as examples. Practices of good governance are important but offer no panacea. For example, health sector reform in Brazil built the Unified Health System according to a dense corpus of administrative instruments for organizing decentralized service networks and routinizing complex decision-making procedures. The intent was to increase regional equity in terms of the distribution of funds and the use of health services. However, research shows that access remains extremely unequal across income, employment status and level of education.[64]

Our understanding of urban health dynamics, like other aspects of urban development, also needs to be more informed by the extent of rural–urban links. Official boundaries between rural and urban populations are often too rigid and may not reflect the perceptions or realities of the people living in either. Populations and activities described either as

'rural' or 'urban' are more closely linked across space and sectors than previously assumed. The strength of rural–urban interaction and interdependence is illustrated by large numbers of multi-spatial households and enterprises, with linkages maintained through temporary and long-term circulatory mobility, remittances and exchanges of goods and information. These linkages can be far more than simply emotional and symbolic; they can be important household strategies aimed at maximizing the benefits and minimizing the hardships in both areas. At the household level, divisions of labour and power according to gender, age and relationships to other household members, affect the propensity and freedom of different individuals to engage in rural–urban migration in the first place. The extent, frequency and importance of rural–urban ties therefore vary considerably over space and time, and according to the strategies adopted by numerous different types of households.

The importance of rural–urban links in health is most frequently illustrated in the transmission patterns of HIV/AIDS and other infectious diseases. In some contexts the interaction between rural and urban populations contributes to low-income rural and urban populations sharing similar disease patterns and risk factors for disease. For example, detailed mobility and treatment-seeking survey work was carried out with 248 lifelong rural residents and 284 low-income urban resident mothers in coastal Kenya.[65] Indicators of strong rural–urban ties included:

- 32 per cent of lifelong rural resident mothers had husbands resident elsewhere, most commonly (80 per cent) in an urban area.
- 33 per cent of urban resident mothers had spent at least 10 per cent of nights in the year preceding the interview (or since migration into the current household of residence) elsewhere, primarily in rural areas.
- 10 per cent of lifelong rural resident mothers had spent at least 20 per cent of nights over the previous year with urban residents (through their own visits and through visitors in their households), and 14 per cent of urban residents had spent at least 20 per cent of nights with rural residents.
- 61 per cent of urban resident mothers reported regularly assisting at least one individual resident elsewhere, with most assisted people (90 per cent) resident in a rural area.
- 74 per cent of urban resident mothers stated that they wished to 'retire' in a rural area.

The importance of moving beyond the rural–urban divide is likely to influence the next decade of research and policy concerning urban health.

Table 9.3

Relative risk of diarrhoea among children under six in Accra

Factor	Odds ratio	95% confidence interval
Use pot for storing water	4.3	1.7–11.1
Water interruptions are common	3.1	1.4–6.6
Share toilet with >5 households	2.7	1.2–5.8
Purchase vendor-prepared food	2.6	1.1–6.2
Open water storage container	2.2	1.1–4.3
Outdoor defecation in locality	2.1	1.1–3.9
Many flies in food area	2.1	1.1–3.8
Do not always wash hands before preparing food	2.0	1.1–3.8
Number of observations = 500		

Source: Songsore and McGranahan, 1998.

Box 9.2 Inequalities in health: absolute versus relative poverty

On the basis of a review on inequalities in health at a national level, Richard Wilkinson stressed that the most egalitarian societies had lower national mortality rates. He suggested that the pathway between low income and poor health outcomes revolved around psychosocial factors; that knowledge of 'how the other half lives' affects psychosocial well-being and therefore overall health status. Regarding the importance of *relative* and *absolute* poverty to health outcomes in developing countries, he suggests that prior to a society's (or city's) epidemiological transition, absolute standards of living have an important impact on health: infectious and parasitic diseases are widespread and access to clean water, adequate food, sanitation facilities and good quality housing are essential in maintaining good health. The importance of relative poverty at this stage is the unequal power relations that enable some to gain access to these features, while others are deprived. During and after the epidemiological transition relative standards of living become more important: people's access to basic necessities of life *and* the subjective experience of the circumstances in which they live impact on health. At this stage, poor groups living in unequal societies suffer both the direct material effects of deprivation (absolute poverty) and its indirect psychosocial consequences (relative poverty).

> *'From the point of view of the experience of people involved, if health is being damaged as a result of psychosocial processes, this matters much more than it would if the damage resulted from the immediate physical effects of damp housing and poor quality diets… To feel depressed, cheated, bitter, desperate, vulnerable, frightened, angry, worried about debts or job and housing insecurity; to feel devalued, useless, helpless, uncared for, hopeless, isolated, anxious and a failure: these feelings can dominate people's whole experience of life, colouring their experience of everything else. It is the chronic stress arising from feelings like these which does the damage. It is the social feelings which matter, not exposure to a supposedly toxic material environment. The material environment is merely the indelible mark and constant reminder of the oppressive fact of one's failure, of the atrophy of any sense of having a place in a community and of one's social exclusion and devaluation as a human being.'* [i]

Wilkinson proposes that relative inequalities in income lead to a breakdown in a society's social cohesion, creating chronic psychosocial stress with both direct and indirect negative influences on both physical and mental health. The deterioration of community life and subsequent rise in violence and crime have a detrimental impact on all members of society, not just the poor. It is the proximity of the urban poor to what are frequently some of the richest people in the world that has been linked to much of the tension and social unrest characteristic of urban areas.

Source: Summary of Richard Wilkinson's work on inequalities in Blue, 1999.
Note: i Wilkinson, 1996, p 215, cited in Blue, 1999, p 21.

Box 9.3 Promoting health: more than medicine

Globalization focuses on a narrow definition of health as the absence of disease. It emphasizes the improved opportunity for the transfer of medical technologies to address health problems. The bulwarks of modern medicine – immunization, antisepsis, antibiotics and other essential drugs, anaesthesia and analgesia – alongside the knowledge to use these rationally, are, of course, important. But, the biomedical view largely ignores the overwhelming evidence that health improvement is brought about by more than just the introduction of modern medical technology. Biased by technological optimism, it fails adequately to grasp the wider social, economic and political environment within which health is improved and health care is delivered. Health improvement needs development as well as medical technologies.

In the North, mortality from the diseases that now cause the greatest disease burden in the South were already in decline long before the medical technologies were available to cure them. Tuberculosis kills 26 per cent of the adult population of the South today.[i] It affected a similar proportion of the population in the North in the 19th century. The decline in mortality from this deadly disease was brought about through improved nutrition and a more equitable distribution of income. This, in turn, led to improved host resistance to this deadly mycobacterium.[ii] Better health requires more than the delivery of better health technologies. It must also encompass poverty alleviation, public health services and the meeting of basic civil rights.[iii]

One of these civil rights is the equitable delivery of international public goods, including medicines and health care. However, the new institutions and rules of the global market do not facilitate their equitable delivery. For instance, South Africa, where 50 per cent of antenatal women carry the HIV virus,[iv] cannot afford to buy essential drugs to prevent the transmission of HIV from mother to new-born child because it must adhere to World Trade Organization-initiated patent legislation, the Trade and Intellectual Property Rights (TRIPS) agreement and is unable to buy the generic form of the anti-AIDS drug AZT from India at a price five times lower than the same drug marketed by a multinational pharmaceutical company. South Africa has been threatened with sanctions by the United States if it buys the cheaper generic drug.[v] A price cut in HIV/AIDS drugs, announced by five major pharmaceutical companies in the spring of 2000, was a step in the right direction, but was expected to have little impact in sub-Saharan Africa, where 70 per cent of the world's 33.6 million HIV-infected people live. Aside from costs, there are additional barriers to the health improvements of this population. The effectiveness of the drugs depends on a balanced and adequate diet, which is often impossible because food is unavailable or too expensive. In addition, AIDS treatment typically requires a strict regimen of medication that must be taken according to a set schedule, which may not be possible in more rural areas where roads may be cut off by floods, delaying critical deliveries. Further, many people who are HIV-positive die from other causes, such as pneumonia, because they lack the medicines to fight these curable diseases that attack their weakened immune systems. A careful series of studies of diarrhoeal disease among children in Bangladesh found that the single greatest determinant of reduction in associated mortality were increases in the level of education among women.[vi]

Clearly, effective promotion of health requires the availability of required medicines and commensurate know-how. However, within the panoply of human settlements considerations, these elements are only part of a broader approach that also includes strategies to eliminate poverty, improve education and develop physical and organizational infrastructure.

Source: The material for this box is drawn from 'Globalization, Polarization and the Poor', a paper prepared by Nick Emmel, The Nuffield Institute for Health, The University of Leeds, Britain.
Notes: i Farmer, 1997; ii McKeown et al, 1975; iii Sen, 1999b; iv Walker, 1999; v Bond, 1999; vi see Muhuri and Menken, 1997.

Notes

1 This chapter draws heavily on 'Urban health in the context of poverty, inequity and polarization trends in developing countries', a background paper prepared by Trudy Harpham and Sassy Molyneux, which is based on material originally prepared for the US National Academy of Sciences' 'Panel on Urban Population Dynamics'.

2 A sad example from the annals of American history is the spread of smallpox among Native Americans, promoted by Europeans like the British commander Sir Geoffrey Amherst, who in 1763 wrote '*You will do well to innoculate the Indians by means of blankets [contaminated by smallpox] as well as to try every other method that can serve to extirpate this exorable race*'. See Thornton, 1987.

3 See www.who.int/hpr/cities/index.html. A recent review describes the origin of the Healthy Cities Programme and presents case studies from Egypt, Pakistan and Brazil, while examining the roles of international agencies, local government and grassroots organizations in the long-term sustainability of schemes established under the programme; see Werna et al, 1999. See also Kenzer, 1999. Both articles are part of a special issue on 'Healthy Cities, Neighborhoods and Homes'.

4 PAHO, 1998a; Tanner and Harpham, 1995.

5 Mbizvo et al, 1993; Mock et al, 1993; McCombie, 1996; Fawcus et al, 1995, 1996; Root, 1997.

6 Reviews by Beevers and Prince, 1991; Muna, 1993; Walker, 1995, Walker and Segal, 1997; Walker and Sareli, 1997; and studies by McLarty et al, 1996; Steyn et al, 1996; Ceesay et al, 1996; Delpeuch and Maire, 1997.

7 Bah, 1993; Bahr and Wehrhahn, 1993; Taylor, 1993; Fawcus et al, 1995; Brockerhoff, 1994; 1995; Brockerhoff and Brennan, 1998; Gould, 1998.

8 Feachem et al, 1990.

9 WHO, 1996.

10 Frenk et al, 1998; PAHO, 1996; 1998a, cited in Grant, 1999.

11 Barata et al, 1998; Grant, 1999. See Chapter 17 for a more extensive discussion of aspects of violence.

12 Grant, 1999.

13 Barata et al, 1998, p7.

14 Mock et al, 1999; Kayombo, 1995; Byarugaba and Kielkowski, 1994.

15 Odero et al, 1997.

16 Mock et al, 1999.

17 Odero, 1995.

18 Grant, 1999.

19 See Road Traffic, available at www.transport.gov.za/docs/green p3e.html; accessed on 17 July 2000.

20 Odero et al, 1997. The OECD collects regular road accident data from the member and associate countries of the European Conference of Ministers of Transport; see www.oecd.org/cem/index.htm.

21 Bartlett et al, 1999; Mock et al, 1999; Knobel et al, 1994.

22 Sixteen studies reviewed by Blue, 1999.

23 Harpham, 1994.

24 Thoits, 1995.

25 Ekblad, 1993; Fuller et al, 1993; Satterthwaite, 1993; 1995.

26 Harpham, 1994; Parry, 1995; Harpham and Blue, 1995.

27 Blue and Harpham, 1998.

28 Moser and Shrader, 1999.

29 See, for example, Evans et al, 2001; Hardoy et al (2001).

30 For more information, see www.ban.org/.

31 See the Key Issues and Messages at the beginning of this report.

32 Timaeus and Lopez, 1996.

33 Stephens et al, 1994.

34 Bella et al, 1993; Allain et al, 1997.

35 Kearns, 1988; 1993.

36 Vögele, 2000.

37 Vögele, 2000.

38 Szreter, 1997.

39 Brockerhoff and Brennan, 1998.

40 See Gould, 1998.

41 Boerma et al, 1999.

42 See Haddad et al, 1999.

43 Fonsesca et al, 1996.

44 See Stephens et al, 1994.

45 See, for example, von Schirnding et al, 1991; Mock et al, 1993; Molbak et al, 1992, 1993; Ekanem et al, 1994; Fonesca et al, 1996; Mahalanabis et al, 1996; Mirza et al, 1997; Byass et al, 1995; Awasthi and Pande, 1998; Molyneux et al, 1999; Sinha et al, 1999; van Rie et al, 1999.

46 WHO, 1992, cited in Satterthwaite, 1993.

47 Kitange et al, 1996.

48 Boerma et al, 1998.

49 van Rie et al, 1999.

50 Knudsen and Slooff, 1992.

51 Bradley et al, 1992.

52 Such inequities have been well established for more developed economies, in particular the US. See 'Polarized communities, unhealthy lives: the effects of inequality and economic segregation on mortality in metropolitan America', a background paper by Waitzman and Smith, University of Idaho. A recent examination of data using the Luxembourg Income Study found that greater income inequality was related to premature mortality in 14 OECD countries; Lobmayer and Wilkinson, 2000. For a recent review of the relationships between health inequalities and housing, see Dunn, 2000.

53 Published in a special issue of *World Development* (November 1999), and by Brockerhoff, 1994; 1995; Timaeus and Lush, 1995; Stephens, 1996; Stephens et al, 1994.

54 Popkin, 1999, p 1908.

55 See Monteiro et al, 2000; South Africa Department of Health, 1998.

56 Brockerhoff, 1994; 1995.

57 Brockerhoff, 1993, p10, cited in Stephens, 1996.

58 See, for example, de Arias et al, 1999, and 'Improved Housing and Spraying to Fight the Spread of Chagas' Disease'. International Development Research Centre , Canada, available at http://voyager.idrc.ca/nayudamma/chaga_67e.html. For a recent longitudinal study of health effects of housing in the context of a more developed economy, see Marsh et al, 2000.

59 Stephens et al, 1994; Stephens, 1996.

60 Stephens et al, 1994; Timaeus and Lush, 1995.

61 Mitlin et al, 1996; Mutatkar, 1995; Wang'ombe, 1995; Atkinson et al, 1996; Todd, 1996; Harpham, 1997.

62 Mitlin et al, 1996.

63 Mitlin et al, 1996, pp 5–6.

64 See Almeida et al, 2000.

65 Molyneux et al, 1999.

CHAPTER 10

ASSESSMENTS OF THE URBAN ENVIRONMENT: WATER SUPPLY AND SANITATION SERVICES

In 1900, only one in ten people lived in cities but today half of the world population – well over 2900 million people – lives in urban areas. Already, 19 cities – 15 of them in the developing world – have populations exceeding 10 million. The result is that during the last century, the combined municipal and industrial use of water worldwide grew 24 times while agricultural use of water increased only five times.[1]

Only 1 per cent of the world's water resources provides the fresh water necessary for agriculture, industry and human consumption. To meet the present urban demand for water, more than half of Europe's cities, for example, are already overexploiting groundwater reserves and many countries report groundwater pollution. Mexico City has sunk more than 10 m over the past 70 years because of excessive withdrawal of water from groundwater sources. Bangkok is facing the problem of intrusion of saltwater into aquifers. The city of Johannesburg draws water from over 600 km away, from the Lesotho highlands. Despite these efforts, it is estimated that currently over 20 per cent of the world's population faceswater shortages. Furthermore, the constant search for freshwater for cities is a potential source of international conflict and water wars.

The problem of water in cities has not only been affected by the rapid process of urbanization but also by the unprecedented urbanization of poverty. It is estimated that over a thousand million people live without adequate shelter and access to basic services such as clean running water. In many countries, the poor pay exorbitant prices to private vendors for clean water. Paradoxically, as the poor struggle for water, in many cities up to half of the water supply is lost through leakages and illegal connections. Such inefficient and inequitable mechanisms for the delivery of water increase the likelihood of conflict within cities. Water supply and sanitation are of critical importance in the equitable and sustainable development of human settlements.

This part of the report reviews documents, databases and research of the past five years to identify important accomplishments, gaps and implications for addressing water and sanitation issues in human settlements programmes. The next section briefly reviews how water and sanitation issues were addressed in 1996 at Habitat II. It then updates that perspective with a brief survey of issues, accomplishments and data presented at The Hague conference.

From Habitat II to The Hague World Water Forum: Global Patterns and Trends[2]

Habitat II followed the International Decade of Water Supply and Sanitation (1980–1990) which established many of the international organizations and programmes in this field. The Decade was also followed by critical appraisals of what was and was not accomplished.[3] Most notably, an international advisory group, the Water Supply and Sanitation Collaborative Council (WSSCC) was established, and the International Water and Sanitation Centre (IRC), the Global Applied Research Network (GARNET) and the United Nations agencies WMO, UNESCO and UNICEF expanded their information services. New research centres, for example the Water Engineering Development Centre (WEDC) at Loughborough University, were also established.

The second Global Report on Human Settlements, *An Urbanizing World*, included coverage of water and sanitation issues based mainly on country data, self-reported as percentages of urban and rural populations with access to safe water supplies and adequate sanitation services. City data were also self-reported as numbers of persons served for a selection of 160 cities.[4] Technical papers, newsletters and other materials presented in Istanbul provided a wealth of additional information, perspectives and examples of water and sanitation projects. *An Urbanizing World* did not indicate which water and sanitation problems were most acute or how they have been addressed. Similar types of data have been presented in annual reports of the World Bank and other United Nations agencies.

Many countries report 100 per cent access to safe water and sanitation. However, even in the US, regular government surveys find a percentage of homes that lack indoor plumbing, safe water supply and basic sanitation.[5] And those results do not include homeless persons or temporary migrant workers. Curiously, international reports often devote more attention to national than city-level data, though the latter present a more promising strategy for two reasons. First, urban units of analysis are more clearly specified, verifiable and relevant to policymaking. Second, urban-level data offer opportunities for comparative analysis (eg cities of comparable size, economic activity, governance structures and environmental context). Indeed, one clear recommendation is that information should be disaggregated to the local level.

As elaborated in the Water Supply and Sanitation Collaborative Council report for Vision 21 at The Hague in 2000, there are serious and recognized problems with data on the provision of safe water and adequate sanitation. Definitions and standards of 'access' vary across countries, data are not comparable over time, there is no independent collection or verification of data quality, and the sample design for estimating national levels of access is unclear.[6] Recent data suggest that international data seriously overstate urban access to safe water supplies and sanitation.[7]

The Hague Water Vision 21: Water for People

The World Water Forum's 'Water for People' component of Vision 21 produced a report titled, *A Shared Vision for Hygiene, Sanitation, and Water Supply, and A Framework for Mobilisation of Action*. In contrast with previous reports, it did not reproduce national data tables on the percentages of populations *with* access to water. Instead, it produced graphs of the numbers of people *without* access to water and sanitation. Although subject to the reservations mentioned above, these graphs suggest that the number of people without safe drinking water has increased in Africa but declined significantly in Asia and the Pacific and in the world overall between 1980 and 1994. However, the number of people without adequate sanitation appears to have increased worldwide between 1980 and 1994 to almost 3000 million. The report discussed problems with those data and went on to present a qualitative discussion of the issues. It made 13 points ranging from the assertion of a human right to water (comparable to claims for a human right to housing) to increased emphasis on hygiene and sanitation, gender and institutions. The framework for action set targets for 2015 and 2025 and for improving monitoring strategies. Some organizations questioned whether sufficient emphasis was given to sanitation and its links with water and development.[8] In a speech to symposium delegates, Klaus Töpfer, Executive Director of the United Nations Environment Programme (UNEP), emphasized better urban governance as the key to the conservation of water. He called on cities and city authorities to adopt a six-point integrated strategy for managing urban water resources. The first step is for local authorities to carry out city-wide water audits. Second, policies need to be introduced to stop the pollution of water sources and to protect watersheds. Third, local authorities must use new technologies to minimize the amount of water lost through leakages and illegal connections. Fourth, socially sensitive pricing policies should be introduced which neither protect nor penalize the poor but remove any opportunity for prolifigate use. Fifth, city authorities must involve industrialists and community groups in the design of innovative ways of recycling wastewater. Sixth, each city needs to set up an integrated strategy for demand management. This includes launching city-wide campaigns to change people's attitudes towards freshwater conservation.[9] UNCHS and UNEP also organized a session on water problems in megacities and contributed to other sessions. However, overall, The Hague conference did not feature a comprehensive appraisal of water and sanitation in the context of human settlements development.

Persistent and Emerging Gaps

One way to address water and sanitation problems in human settlements is to focus on key 'gaps': gaps between different kinds of water problems; gaps between places or people that are well served and those that are poorly served; gaps between previous objectives and actual accomplishments; gaps between what is known and unknown, and so on. Six such gaps and responses to them over the past five years are highlighted below.

Gaps between water supply and sanitation

The gap between access to safe water supply and adequate sanitation has been recognized for decades, but appears to persist. Sanitation is deemed to be a key determinant of vulnerability to water-related disease, and the 'sanitation gap' may indicate where investment in water supply should be redirected towards sanitation and hygiene improvements. Data from *An Urbanizing World* indicate that many countries report large gaps between access to safe water and sanitation. Provision of improved water supplies, without adequate sanitation, can aggravate unhealthy drainage and disease vector problems. Additionally, hygiene behaviour may be as or more important than wastewater connections.[10] Some countries report no sanitation gap, or even a higher level of sanitation than water service. If these data are accurate, they should be examined either for possible lessons or to identify cases of severe water scarcity.

The Second World Water Forum concluded that the sanitation gap has persisted. Some 3000 million people are estimated to lack adequate access to sanitation, more than twice the number of persons who lack access to safe water supplies. The world sanitation gap and associated water-related disease vectors are especially worrisome in rapidly urbanizing regions. In response, an international Global Environmental Sanitation Initiative (GESI),[11] begun in 1997, was re-launched in 2000 to underscore its importance. Proposed sanitation programmes call for bridging between wastewater treatment, hygiene education, human waste disposal and collection and solid waste management.[12]

Some 3000 million people lack adequate access to sanitation, more than twice those without safe water. The associated water-related diseases are especially worrisome in rapidly urbanizing regions. We need programmes that bridge between wastewater treatment, hygiene education, human waste disposal and collection and solid waste management

While some progress has been made in linking water supply and wastewater treatment, these water sector activities remain weakly linked with solid waste management. At the same time, the past five years have witnessed continuing advances in innovative sanitation initiatives such as the Orangi Pilot Project in Karachi, Pakistan,[13] and Sulabh

International in India.[14] Recent research has been extended to address the politics of sanitation and wastewater treatment.[15] The experience is not uncommon that water supply comes first and that sanitation comes later with more money and education.

In each case, there has been increasing recognition of the importance of sanitation in urban settlements, and of the importance of community-based schemes for empowerment of often-stigmatized and exploited social groups. Sulabh International, for example, began with the aim of improving the social status, as well as health and livelihood, of sweepers in India.[16] Discriminatory service based on ethnicity, particularly in situations and periods of violent conflict, is reported but rarely analysed. In cases where waste disposal involves toxic chemicals, the gap shifts from environmental equity to environmental justice,[17] bringing into focus interrelationships that need additional attention.[18]

Gaps in gender equity and empowerment

Questions of equity and justice are also central to concerns about women's access to safe water and sanitation. The International Decade on Water Supply and Sanitation and the Dublin International Conference on Water and Environment (1992) succeeded in concentrating attention on women's heavy responsibilities for household and farm water management, and issues of equity, abuse and empowerment. Following the Decade, the IRC in The Netherlands has compiled and distributed a wealth of research and training material advancing the participation and empowerment of women.[19] The PROWWESS Project is dedicated to the Promotion of the Role of Women in Water and Environmental Sanitation. The Hague conference in 2000 also included papers on gender equity in household and farm water management; described the 'mainstreaming' of water and gender issues by IRC, the International Water Management Institute (IWMI), IUCN and the United Nations Development Fund for Women (UNIFEM); and it called for the establishment of a Gender Water Alliance.[20]

To what extent have these efforts eased women's burdens of village water carrying and vulnerability to urban water and sanitation inequities? The Women's Environment and Development Organization[21] analysed 18 case studies where women's activism has made a difference in water resources equity and environmental quality.[22] Research on women and water has also expanded in scope and depth.[23] However, research on water and gender continues to document cases of the greater vulnerability of girls to water-related diseases and lower levels of medical attention for diarrhoeal disease.[24] These inequities also translate into, and are compounded by, inequities in other social sectors, notably education.[25] On the one hand, mothers' coping strategies and resources for dealing with water-related disease episodes may have expanded with oral rehydration (ORS), hygiene and women's education programmes. Women are more effectively organizing at local to international scales on water issues ranging from village water systems to dams that threaten to inundate villages. On the other hand, many infrastructure programmes continue to exclude women from planning and implementation decisions. These inequities are compounded in other regions by changing household structures and outmigration of male family members for work, which can increase women's responsibilities and coping pressures in the home. Reports presented at The Hague 2000 conference indicate that community-level research and projects continue to advance, but it is not clear how those projects 'scale up' to larger metropolitan levels where male roles are more dominant.[26] International programmes have tended to equate 'gender' with women, failing to direct attention to how the changing roles of men in water management (eg in urban water utilities, flood control, irrigation and environmental engineering) affect equity and livelihood from the household to metropolitan scale.

Gaps in institutional and financial restructuring

As in many sectors, the 1980s and 1990s were a period of institutional experiments and restructuring in water resources management. Institutional changes included increasing roles for non-governmental and activist organizations as well as changes in bureaucratic, legal and market institutions. The Dublin and Hague water conferences called for expanding social participation, devolution of authority, reform and coordination of bureaucratic organizations, and capacity building at all levels of governance. For example, Vision 21 called for the establishment of regional sanitation resource centres to expand programmes of training, education and access to technical information.[27]

Institutional experiments have focused on community-scale water and sanitation initiatives, several of which are featured in the UNCHS Best Practices database. Successes at the community level have sometimes proved difficult to 'scale up' to metropolitan, regional and national policy levels.[28] Weaknesses in municipal and state water bureaucracies have contributed to pressures for financial reforms, which range from improved billing practices to water pricing, marketing and, in some cases, full privatization of water and sanitation utilities. The 1992 Dublin Conference called for treating water as an 'economic good'. In the late 1990s, the World Bank, World Water Council and other organizations went further in testing and reporting on water pricing, marketing, property rights and privatization experiments in South America and elsewhere.[29] In these experiments, water is treated as an article of commerce and the utility as a business.[30]

● Privatization and commodification of water

In 2000, the World Water Commission also called for treating water as an economic good with targeted subsidies for the poor, but the conference was disrupted by protestors on precisely these points of privatization and water marketing. At about the same time as The Hague Conference, a 'water war' erupted in Cochabamba, Bolivia, over privatization and pricing of domestic water services (see Box 10.1). Resistance to water marketing and privatization has arisen

Box 10.1 Cochabamba's water war: organized protest against privatization of a public resource

In April 2000, a coalition of peasant unions, student groups, working class unions and ultimately much of the general population as well as segments of the national security forces, joined to protest against the privatization of the public water system in the Bolivian city of Cochabamba, with a population of half a million.

The proposed sale, promoted by the World Bank, would transfer control of Cochabamba's water system from local authorities and the Bolivian government of Hugo Banzer to Aguas del Tunari, a multinational consortium of private companies that would 'dollarize' and sharply raise rates, in some cases to US$20 a month. The monthly minimum wage in Cochabamba is less than US$100.

In response to the announcement, a new organization, Coordinadora de Defensa del Agua (Coordinators in Defense of the Water) formed and a four-day general strike shut down the city. The government announced a reversal of the new water rates, but when it failed to abide by its promise, the Coordinadora called for public protest. The president sent thousands of heavily armed anti-riot police, who clashed violently with the unarmed protesters, resulting in more than 175 injured civilians. Forced by public anger, the government and water company again promised cancellation of the rate increases. However, with popular sentiment against the sale of the water system growing, Cochabamban residents demanded that the whole contract with Aguas del Tunari be cancelled and that the move towards privatization itself be reversed. A survey of about 60,000 residents showed that 90 per cent opposed privatization.

The people of Cochabamba went back to the streets and called for another general strike, which brought the city to a standstill. Coordinadora got the support of the peasants' union that was fighting a parallel struggle against the privatization of water provision in the countryside and against the Land Reform Law that would benefit big landowners. Thousands of peasants organized road blocks in six of Bolivia's nine districts. On 6 April, residents stormed the local city hall and surrounded the building where talks were taking place between the Coordinadora and the authorities. The government arrested all 15 leaders of the Coordinadora.

After massive demonstrations of peasants and Cochabamban residents, the protest leaders were released a day later and the archbishop announced that the government had agreed to cancel the contract to privatize the water system. However, soon after, the national government reversed this decision, claiming that regional authorities had made it without their permission. Next, the regional governor was replaced by a military officer, and the Banzer government declared a State of Emergency. It suspended basic rights, prohibiting strikes and gatherings of more than four people, while permitting legal use of the army to prevent civilian unrest.

The army arrested 22 union leaders in house-to-house searches, as the protests in Cochabamba grew into widespread discontent throughout the country. In the next few days, the military responded to separate disputes in Sucre where university students had gone on a hunger strike and in the Southern District of Tarija where the president had been declared a 'persona non-grata'. The army killed two people in an attack on 2000 peasants who were blocking a road 95 km from the capital La Paz, while military actions caused additional fatalities in ongoing protests in Cochabamba and Lahuachca.

Rather than quell popular discontent, the State of Emergency declaration further antagonized a population already upset with the government's attempts to privatize Cochabamba's water system and its wider disregard for basic needs that the sale represented. A call by rural teachers for a general national strike was joined by students and the main trade union. About 20,000 peasants marched to Cochabamba and the miners' union warned that its actions were just the beginning of the struggle against the Banzer government's acquiescence to sale of the country's resources to international companies. Aguas del Tunari announced that it was withdrawing from the deal.

Coordinadora called off the strikes when it became clear that the privatization of water provision in Cochabamba and in the countryside would not occur. The government agreed with peasant unions to pay 'compensation' to the families of the people who had been killed in the police violence. However, in April 2001, there were renewed tensions throughout the nation.

Although the immediate cause of the unrest had been removed, the continuing actions in Cochabamba reflect growing popular discontent with attempts to privatize the country's public resources, seen also elsewhere. Ecuador, for example, early in 2000, suffering a precipitous decline of living standards, 60 per cent rate of inflation and an economic depression after a decade of enforced structural adjustment policies during the 1990s, experienced massive protests by Indian peasants, urban workers, junior military officers and lower clergy. A few months later, Costa Rica also saw widespread turmoil, when a general strike by electricity, water and oil company workers, teachers, public hospital employees and city and federal government employees shut down the entire city of San Jose and demonstrators blocked major highways throughout the country, demanding cancellation of plans to privatize the national telecommunication and power industries. A Gallup poll showed that 64 per cent of the population opposed the proposed bill, which the national Constitutional Court declared to be unconstitutional.

These and similar episodes illustrate the emergence of broad-based coalitions acting in opposition to the dominant impacts of translocal, profit making and private accumulation.

Source: Netta van Vliet.

in many regions.[31] Although private water utilities are a relatively small proportion of all utilities in 2000, pressures for privatization are increasing worldwide. If this trend continues, access to safe water will increasingly become a human rights issue.

Proponents of privatization argue that sound financial management can benefit the poor who are less likely to be served by underfinanced and deteriorating infrastructure. Squatter settlements often rely on water vendors at tens to hundreds of times the cost of water supplied by properly financed private or quasi-public utilities.[32] Critics stress the lack of private accountability to public needs and regulation; higher risks of disconnection and reduced service for the poor; market segmentation and formation of 'dual systems' where some are served at higher, and others lower, levels; and failure to follow through with proposed subsidies for

the poor.[33] Some utilities and legislatures object to requiring higher-income customers to subsidize low-income customers on grounds of equity.[34]

Research has also examined the impacts of commodification in the UK, which privatized all of its regional water utilities in 1990. British water companies were subjected to regulatory oversight by the Office of Water (OFWAT).[35] Concerns about the effects of privatization on the poor ranged from disconnections to financial distress and increased water-borne disease.[36] Initially, disconnections for non-payment increased dramatically. Increased public regulation and enforcement of those regulations by OFWAT followed, to the point where British water utilities now have fewer disconnections than before privatization. Strong public regulation and a parliamentary threat of banning disconnections altogether were key factors in reducing social impacts; but concerns persist about long-term consequences for the poor. The US National Research Council (NRC) is currently studying privatization of water provision in the US.[37] In rural areas, 'small systems' that serve towns receive less technical and financial assistance from public sources than larger cities, and there is concern that they would receive even lower service from private utilities.[38]

Although the number of case studies is increasing, they often employ different methods and are rarely comparable across the full range of impacts of concern.[39] Clear conceptualization of 'access' to safe water and sanitary conditions (eg as compared with 'rights' to such resources) is important for increasing the comparability of case studies.[40] More research is also needed on customer access and exclusion under different water rate, tariff and billing practices.[41]

Political analyses of water and sanitation institutions and economies have broadened in the past five years to ask persistent questions about which social groups are, and are not, served;[42] about the evolving roles of water vendors, entrepreneurs, sanitation workers and microfinance organizations;[43] about the special problems of restructuring in borderland regions;[44] and about emergency water and sanitation needs in areas of conflict and post-disaster reconstruction.[45] The coming decade will see broad institutional experimentation in the provision of water and sanitation that will require rigorous evaluation.[46]

Gaps between water infrastructure and environmental management

Water and sanitation have often been viewed as 'infrastructure and services' programmes, while broader links with and implications for urban ecosystems are neglected. Urban withdrawals from streams and aquifers have long-term consequences for sustaining human benefits from natural hydrologic, aquatic and riparian ecosystems. Even well-sewered cities can discharge untreated wastes into urban watercourses, polluting drinking, bathing, washing and fishing waters.

The Istanbul+5 *Guidelines for Country Reporting* address several water and sanitation indicators under the heading of 'Environmental Management' (indicator 13: water consumption; indicator 14: price of water; and indicator 16: wastewater treated) along with urban population, transport, air pollution, solid waste disposal and natural hazards mitigation.[47] The relationships between these environmental indicators are not yet entirely clear, but some research has begun to link water supply and sanitation variables to measures of 'ecosystem services' and 'ecosystem health', which are in turn related to economic and human health benefits.[48] Other projects have employed concepts of 'sustainability' or 'carrying capacity' from environmental management to address issues in infrastructure planning.[49]

More immediately pertinent to the water and sanitation sector are emerging programmes in 'ecological sanitation'.[50] Ecological sanitation employs biological methods of waste treatment, disposal and reuse (eg wastewater lagoon and ponding systems) and seeks to link infrastructural development with environmental restoration. 'Ecological sanitation' encompasses a broad range of linkages between water use, land use, wastewater management, and urban agriculture.[51]

Ecological sanitation employs biological methods of waste treatment, disposal and reuse and links infrastructural development and land use with environmental restoration

In Japan, for example, the UNEP International Environmental Technology Centre (1999) is focusing on urban water supply in ways that reduce eutrophication in lakes.[52] In a related vein, some organizations have sought to rediscover and adapt traditional water management systems to new urban and rural settlements. An outstanding example is the Centre for Science and Environment's study entitled, *Dying Wisdom: Rise, Fall and Potential of India's Traditional Water Harvesting Systems*.[53] Urban environmental hazards have implications, often little examined, for water supply and sanitation. In this connection, UN Disaster Information Briefs often cite disruptions of, and need for, emergency freshwater supplies and infrastructure restoration. Similarly, the World Bank has recently sought to link project lending with disaster mitigation, and the International Development Research Centre (IDRC) has launched a water demand management programme in North Africa and the Middle East.[54]

To be effective over the long term, these efforts must be integrated with urban ecosystem processes, including those most closely related to water supply and sanitation. Cities should begin to monitor key ecological variables along waterfronts, river corridors, riparian habitats, wetlands and floodplains. Urban riverfront restoration programmes, which are increasingly promoted (eg on the Sabarmati River in Ahmedabad, India[55]), should include baseline measurement and monitoring to assess their actual vs. planned benefits. This theme of baselines, or benchmarking, and *ex post* evaluation is elaborated opposite.

Gaps between first principles, best practices and *ex post* evaluation

The past five years have shown increasing attention to defining first principles and best practices of water and sanitation management. The 1992 Dublin Water Conference identified four principles:

1 water is a common, shared resource;
2 water should be managed at the lowest practicable level of governance;
3 women's roles in water management should be recognized and empowered;
4 water should be treated as an economic good.

Since Dublin and Habitat II, there have been increasing calls for recognizing a 'human right' to water, comparable with arguments that housing is a human right.[56] The legal and ethical basis for a human right to water in domestic law is strong in some societies; for example the 'right of thirst' for humans and animals in Islamic law, and weak in others; for example US water law. [57] There is growing support for such claims in international law (eg in the United Nations Convention on the Rights of the Child; see also the ascendancy of human rights-based approaches reviewed in Chapter 3).

The prospects for a 'rights-based' approach should be explored. Although some countries do not recognize a strong 'natural right' to water, they may enforce 'moral duties' to provide water or allow access in certain circumstances. Excluded social groups (especially indigenous groups) may have 'paper rights' to water, which are never transformed into the 'wet water' needed for economic development.[58] Arguments for treating water as a human right need not conflict with valuation of water as an economic good. But the complex relations among such views have not been resolved in theory or on the ground.

It seems crucial to have more detailed *ex post* evaluations of urban water and sanitation experiments. While there are many assessments of proposed projects and policies, there are few detailed *ex post* evaluations or post audits of the actual impacts that completed projects have on people and places.

There are few detailed *ex post* evaluations or *post* audits of the actual impacts that completed projects have on people and places

A detailed post audit is one that is *comprehensive*, *integrated*, *long-term*, *cumulative*, *participatory* and *adaptive*.[59] A *comprehensive* evaluation encompasses social, economic, environmental and political impacts. An *integrated* evaluation considers the interactions among those diverse impacts. *Long-term* means evaluation on timescales from years to decades. *Participatory* and *cumulative* assessments are important in the urban water and sanitation field where thousands of household and neighbourhood actions contribute to aggregate urban impacts. Finally, *post* audits should be *adaptive*, contributing directly to the adjustment of policies, projects and programmes as new evidence of their impacts becomes available through monitoring.

Few evaluations fit these criteria of *ex post* evaluation. An important exception is the re-examination of an influential study of water supply in East African villages and towns titled, *Drawers of Water: Domestic Water Use in East Africa*.[60] This restudy of the same villages, 30 years later, represents the most detailed longitudinal examination of community water systems to date.[61]

Preliminary findings indicate which areas have maintained or improved water supplies, and which places have lost ground. Overall, piped water systems appear to have been less well maintained than unpiped systems over the past 30 years. Other excellent experiments – such as the Lahore Old City Cultural Heritage and Infrastructure Upgrading Project in Lahore, Pakistan – have not had adequate baseline documentation or monitoring to determine whether and where the project has met its objectives.[62]

The UNCHS Best Practices Database incorporates a measure of *ex post* evaluation. It includes some 20 projects that focus primarily on water and sanitation, as well as many other projects that have water resources components. They range from innovative sewer construction technologies in industrialized countries to low-income water and sanitation programmes, and from watershed protection to water conservation and wastewater treatment. Some examples from the 1998 database are listed alphabetically in Table 10.1.

The diversity of these water-related projects is striking, and the database helps to facilitate comparison by classifying projects by scale (from village to global), ecosystem, and region as well as by subject category. For the most part, the descriptions of these cases are brief and self-documented. They become icons for replication, but their database entries are not necessarily updated to reflect monitoring results, nor are the limits of replicability discussed. Several other examples of best practices in the water and sanitation field stand out.

Table 10.1

UNCHS Best Practices Database: water resource examples, 1998

Australia	Southwell Park Wastewater Recycling Pilot Scheme
Australia	Western Australia Sewerage and Wastewater Quality Program
Austria	Sewer construction/the Viennese Approach
Colombia	The Community as Drinking Water Provider in a Low Income Area
Egypt	National Public Scheme for Conservation of Drinking Water
Egypt	The Aqueduct Area Project: Urban Environmental Management
Honduras	Empowering Poor Communities in Tegucigalpa: Water Supply
Japan	Fukuoka: Water Conservation Conscious City
Kenya	Maina Village Community Water and Sanitation Project
Kenya	Water for Work Project
Malawi	Piped Supplies for Small Communities in Malawi
Papua New Guinea	Building of Water Tank and House Using Indigenous Materials
Romania	New Technologies for the Water Treatment Plant in Slobozia
Senegal	Community Based Environmental Sanitation and Hygiene Project
Senegal	Women Run Waste Management and Recycling Programme
Spain	Navarra, Water and Waste Management
Spain	Zaragoza: A City Saving Water
Sudan	Rural Towns Water Supply Project in South Darfur State
Sudan	Upgrading of the Water Supply System in Nyala and El Geneina
United Republic of Tanzania	The Health through Sanitation and Water (HESAWA) Programme
USA	Integrated Watershed Management: Government and NGO Partnership

Source: http://www.bestpractices.org/.

The Orangi Pilot Project in Karachi, Pakistan, has had detailed documentation, monitoring and adaptation over the course of more than two decades, conducted by project participants as well as professional planners.[63] For water-borne diseases, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) has conducted long-term health and demographic monitoring at its Matlab and Dhaka sites to evaluate and adapt interventions in diarrhoeal disease reduction, including oral rehydration therapies and hygiene behaviours.[64]

In a recent study of a best practices case, the Indore Slum Rehabilitation project has been critically re-evaluated.[65] This project had developed a concept of slum networking to guide investment in waste collection, stormwater drainage, tree planting and park development. An independent survey of slum residents raised questions about the level, effectiveness and sustainability of these programmes.[66] Project leaders responded with a rebuttal of the criticisms.[67] The example points to the potential for developing innovative methods of critical project evaluation.

The main point here is that *ex post* evaluation is rarely undertaken to determine whether, in fact, people and the places where they live are better or worse off after adopting various first principles or best practices.

Ex post evaluation should be undertaken to determine whether, in fact, people and the places where they live are better or worse off when adopting first principles or best practices

In addition, there have been few comparisons of best practices by city size, subsector or regional context. How different are the problems of historic centres, peri-urban areas and secondary cities? How different are the peri-urban problems of different cities?[68]

For larger urban water utilities, the World Bank has developed a benchmarking and indicator system.[69] Its *Water and Wastewater Utilities Indicators* include operational and financial variables. Major classes of operational variables are water consumption, distribution, unaccounted for water, wastewater piping and flows, wastewater treatment, personnel and equipment. Financial indicators focus on efficiency, leverage, liquidity, profitability and ratios with operational variables. These indicators address utilities management issues. However, they do not yet include the outcomes or impacts of water and wastewater treatment services for the people and their environments.

Existing indicators measure aspects of utilities management, such as efficiency, leverage, liquidity, profitability. They should also include impacts of water and wastewater treatment services for people and their environments

The International Decade for Water and Sanitation (1980–1990) monitored project inputs and activities. Participating organizations, such as the Water and Sanitation for Health project assessed the 'Lessons Learned' from scores of local projects in different regions.[70] Most of those lessons were supported by qualitative and expert judgement, as detailed project baseline data and monitoring designs were rare.

Following the International Decade, three international organizations have maintained continuing programmes of evaluation, documentation and information dissemination concerning water and sanitation. Among universities, the WEDC at Loughborough University has made a sustained commitment to applied water and sanitation research in developing countries.[71] It organizes bi-annual conferences on water and sanitation around the world, and it also supports the GARNET,[72] an electronic database of applied research on water and sanitation.[73] The IRC International Water and Sanitation Centre[74] in The Netherlands is the leading global repository for research and training material on water and sanitation. Together with the WSSCC, it publishes *Source*, a newsletter that reports on case studies as well as new publications and meetings. The WSSCC serves as a consultative and coordinating organization for multilateral and non-governmental organizations working in the field of water and sanitation, and it prepares position papers (eg the Water for People statement for The Hague Vision 21 meetings). Further, a new initiative is underway to manage global water information systems, which may include archiving of *ex post* evaluations and an international strategy for information management.[75]

Gaps between water, sanitation and human settlements policy initiatives

The preceding discussion indicates a need for stronger coordination between water, sanitation and settlement policies. Water and sanitation programmes cannot be properly planned or evaluated without taking into account the structure and dynamics of the settlements they serve. The quality of life in human settlements depends in significant measure on their water and sanitation services.

There is a need for stronger coordination of water, sanitation programmes and human settlement development policies

The programmes mentioned above recognize these connections, but in practice gaps persist between these subsectors of municipal governance. The Habitat Agenda does not make strong links between water and sanitation and other aspects of human settlement. Similarly, the World Water Forum gave limited attention to human settlements issues, programmes and policies. The Hague 'Water for People' documents did not cite UNCHS publications on water for cities,[76] while the vision document for water and sanitation, *A Shared Vision for Hygiene, Sanitation, and Water Supply, and A Framework for Mobilisation of Action*, lacked an explicit analytical approach appropriate to human settlement questions.

Representatives from WSSCC and IRC made important contributions to Habitat II in 1996, and UNCHS and

UNEP made important contributions on 'Water and Megacities' at The Hague. But five years after Habitat II, it is worth asking whether water, sanitation and settlements programmes are adequately integrated, or coordinated, with one another. Evidence indicates that this is not the case.

A case where integration of water, environment and human settlements development policies seems promising is the joint UNCHS/UNEP Managing Water for Cities in Africa.[77] Established in 1999 as a follow-up to the Cape Town Declaration of 1997, this programme is being implemented in seven demonstration cities: Abidjan (Côte d'Ivoire), Accra (Ghana), Addis Ababa (Ethiopia), Dakar (Senegal), Johannesburg (South Africa), Lusaka (Zambia) and Nairobi (Kenya). These rapidly growing cities plan to jointly investigate approaches to water demand management, water supply expansion and environmental protection. Their objective is to promote an integrated approach to managing urban water resources (see Box 10.2). They also plan to compare the applicability of technical, behavioural and financial innovations in other regions of Africa. Ideally, the design of this regional programme will be subject to critical feedback and comparison with urban water programmes in other regions of the world.

Further, recognizing that urban demands for water can affect people in neighbouring regions or countries, UNEP has been working on transboundary water-related issues through the Global Environment Facility (GEF) and the Global International Waters Assessment (GIWA) aimed at developing a comprehensive strategic assessment to identify priorities for remedial actions in international waters.

Box 10.2 Conserving water must start in cities

Only 1 per cent of the world's water resources is freshwater available for human use. This limited resource has to provide a thirsty world with all its needs for agriculture, industry and human consumption. As urban growth continues, many regions of the world are already experiencing severe water stress. Aside from the unnecessary death and suffering that results from lack of safe water, economic development is seriously hampered, food production becomes expensive and many production and service industries become dysfunctional. Urban water demands have a serious environmental impact on water resources, both by overexploitation of fragile freshwater reserves and unacceptable disposal of wastes and toxic substances.

UNCHS (Habitat) and UNEP have recently initiated a project to assist African cities to manage water more effectively. Funded by the Turner Foundation, the project will address issues of water conservation and demand management as well as protection from the effects of urbanization, and is meant to become an example for other regions of the world.

The project has three components: (1) an information and awareness campaign to sensitize all stakeholders to the need for conserving precious resources; (2) a water demand management programme that will demonstrate the benefits to be gained from progressive water tariffs, low-cost water saving technologies and repairing of leaks; and (3) a programme on protecting water quality through policies and planning concerning effluent treatment and discharge from polluting sources.

Promoting good policies and building capacity to manage water more effectively is necessary both to avert a crisis and to reduce the debt burden of developing nations by delaying or reducing the need for large capital investments.

Source: Adapted from 'World Water Day: Conserving Water Must Start in Cities', United Nations Centre for Human Settlements (Habitat); released 18 March 1999.

Implications

This review of water and sanitation in human settlements points towards several overarching implications for an appraisal of progress in implementing the Habitat Agenda. These implications cut across the six gaps discussed above. This discussion concentrates on three such implications.

Focus on gaps

The first implication of this review is that it is important to 'focus on the gaps', rather than broadly review conditions of water and sanitation infrastructure. This review identified six gaps and some promising approaches to address them. The Vision 21 process at The Hague also sought to identify water and sanitation goals for the next quarter-century. However, that process did not give as detailed attention to the settlement context of those gaps and goals as is warranted. The Istanbul +5 process could help to supplement, refine, contextualize and thereby advance those long-term goals.

Improve data, analytical tools and historical reviews

A second implication concerns the utility of international water and sanitation data and the analytical tools needed to monitor and guide human settlements programmes. Questions are increasingly raised about the reliability and utility of national water and sanitation data. National data cannot be made useful, it seems, without major expenditure to refine, standardize and implement scientific sampling designs and techniques, and to provide for independent scientific review. As water and sanitation are generally municipal responsibilities (supported to varying degrees by national financing), it seems more promising to focus on improving urban data. Although urban water statistics face increasing criticism as well, they can be more readily verified and corrected.[78] The development of indicators by UNCHS (Habitat) is also an attempt to improve the availability of data to allow regular monitoring and evaluation as a basis for policy.[79]

In addition to improving the quality of urban water data, the analytical basis for making comparisons and drawing inferences needs attention. At present, comparative studies often employ qualitative case study methods.[80] Even in qualitative studies, greater emphasis is needed on the analytical aims and logic of case study selection, comparison and analogies used to frame policy recommendations. Indeed, it is worth asking: when and how do comparative studies make a practical difference for urban water, sanitation and settlement programmes? For example, during the 1990s when South Africa looked around the world for water policies that worked in other regions, it needed a framework for assessing experiences elsewhere.[81] The UNCHS Best Practices Database provides a useful tool for organizing comparative analyses, in part through its classification of cases by region, scale, ecosystem, and category. As these best practices are subjected to more detailed *ex post* evaluation, they may become even more valuable for comparative research.

Likewise, as urban-scale data improve, quantitative analysis of urban datasets should more effectively complement case study research. In comparison, the observational networks for weather and hydrology are more sophisticated than those for monitoring urban water use and problems. The global urban observatory of UNCHS (Habitat), the water and wastewater utilities indicators of the World Bank and the Large Cities Statistics Project (LCSP) of the International Union of Local Authorities (IULA), the International Statistical Institute (ISI), the Network on Urban Research in the European Union (NUREC), United Nations Statistical Division (UNSD) and UNCHS (Habitat) are useful starts, but they need to go further.[82] Quantitative monitoring of water and sanitation should encompass long-term social and environmental 'impacts' (ie health, livelihood, equity, human development and ecosystem indicators) as well as project 'outputs' (eg length of pipe and number of taps).

Monitoring of water and sanitation programmes should encompass long-term social and environmental impacts on health, livelihood, equity and ecosystems, as well as project outputs in terms of number of taps and length of pipe

Finally, there are few historical studies of international urban water and sanitation programmes. Recent research on irrigation and forestry, in contrast, makes increasing use of historical and cultural geographic research to help to explain current problems and to evaluate alternative solutions to those problems. One of the great accomplishments of many cities in the 20th century was the provision of relatively inexpensive, widely accessible, high-quality urban water supplies and municipal and industrial wastewater treatment systems. How did it happen? And how did water and sanitation innovations diffuse through national and international urban networks? Urban historians have attributed the establishment of modern public water supplies not so much to altruism as to broad civic concern about fires and communicable diseases that crossed class boundaries in late 19th- and early 20th-century cities.[83]

Urban historians have attributed the establishment of modern public water supplies not so much to altruism as to broad civic concern about fires and communicable diseases that crossed class boundaries. Universal access is in the interest not just of the poor, but of the whole of society

Universal access is in the interest not just of the poor, but of the whole of society. As urban spatial structure and environmental hazards change, will the commitment to uniform public water standards give way to segmentation of water and sanitation services based on ability to pay? Other historians have reasserted the importance of ethics, altruism and philanthropy in public water systems ranging from Baroque Rome to Victorian England and Ottoman Istanbul.[84] These historical, cultural and geographical perspectives enrich our understanding of current water and sanitation problems.

Develop clear objectives for coordinating water, sanitation and human settlements programmes

The 'gaps' discussed in the preceding review all imply that some kind of integration is needed – integration of water and sanitation, water and gender, infrastructure and environment, institutions and finances, monitoring and evaluation, and so on. Although integration is often desirable, differences and resistance to integration are sometimes warranted. For example, it has been stated that:

> *'Women do not want to be mainstreamed into a polluted stream. We want to clean the stream and transform it into a fresh and flowing body – One that moves in a new direction – a world at peace, that respects human rights for all, renders economic justice and provides a sound and healthy environment.'*[85]

Resistance can help to identify pressure points and new directions of development.

Basing Policies on Inaccurate Data? The Importance of Critical Scrutiny[86]

International statistics and many national statistics greatly overstate the extent to which urban populations are adequately served with water and sanitation in light of many detailed city studies that show far worse levels of water and sanitation provision.[87] This disparity is important because it appears to bias priorities in the allocation of support, failing to target resources to areas in greater need.

Current statistics greatly overstate the extent to which urban populations are adequately served with safe water and adequate sanitation

This section of the report compares official statistics on provision for water and sanitation in urban areas at a global, regional (continental) and national level with statistics drawn from more detailed city studies. It also questions the criteria used by governments and international agencies to define what is 'access to safe water' and 'access to sanitation' since it is often the inappropriateness of these criteria (rather than the actual statistics) that underlie the inaccuracy of national statistics.

The problem of inaccurate data

Official statistics suggest that problems with provision for water and sanitation in urban areas affect only a minority of urban dwellers. For instance, statistics for 1994 suggested that only 300 million urban dwellers were not served by water supplies in Africa, Asia, Latin America and the Caribbean,[88] which implies that 80 per cent of the urban population is served. UNDP's *Human Development Report 1996* states that by the early 1990s, 87 per cent of the urban population of 'developing countries' had access to 'safe' water and 72 per cent had access to sanitation.[89] This same

source also included a table, suggesting that a considerable proportion of low- and middle-income countries had 80–95 per cent of their urban populations adequately served both by safe water and sanitation (see Table 10.2).[90] It even suggested that 63 per cent of sub-Saharan Africa's urban population had safe water and that 56 per cent had provision for sanitation.

Official statistics also suggest that there has been considerable progress in improving provision, especially for water, and that urban inhabitants are far better served than rural inhabitants. There has indeed been great progress in some countries and particular cities, and there are cities in Latin America and Asia where virtually all households now have water piped into their home.

However, official statistics greatly overstate the extent and quality of provision. There are two main reasons why this occurs. The first is the use of inappropriate criteria to define what is 'adequate' and 'safe'. The second is that governments often provide inaccurate statistics and the international agencies who publish these do not publicly question their accuracy.

International agencies such as the World Bank, the World Health Organization or the United Nations Development Programme are 'inter-governmental bodies' with governing boards made up of representatives of national governments. This makes it difficult (or impossible) for them to openly question the validity of what their member governments report.[91]

Data on water and sanitation provision are often deficient because the statistics are inaccurate and because inappropriate criteria are used to define what is safe and adequate

Water provision

In regard to the criteria used for assessing provision, for water supply to be 'adequate', it must be: of good quality, readily available, piped to the house (or at least very close by), and affordable. But many governments include in their official statistics of people 'adequately' served all households with access to public standpipes or with some form of water-supply infrastructure within 100 m of their home.

Thus, among those classified as 'adequately served' are the inhabitants of settlements where hundreds of people have to share each standpipe, and even if the public standpipes are poorly maintained or contain contaminated water. Households are still classified as served by piped systems, even if water is only available in the piped system intermittently, or as little as one or two hours a day – or even only once a week or fortnight. For instance, in Mombasa, Kenya, there are many households who have water pipes that extend into their homes but who have seen no water in these pipes for years.[92]

Among those classified as 'adequately served' are the inhabitants of settlements where hundreds of people have to share a single standpipe and others who have access to public standpipes that are poorly maintained or contain contaminated water

Perhaps the strongest evidence for the inaccuracies in official statistics comes from comparing official statistics for provision in urban areas with data from detailed city studies.

Evidence for inaccurate statistics comes from comparisons of official data on urban provision with data from detailed city studies

Table 10.2 shows figures for the proportion of some urban populations, allegedly having access to safe water and sanitation, according to UNDP's *Human Development Report 1996* and the World Bank's *World Development Indicators 2000*. According to the UNDP Report, 99 per cent of the urban population of Zimbabwe and Bangladesh had safe water by the early 1990s; for Pakistan, it was 96 per cent, for India 85 per cent, and for the Philippines 93 per cent. The World Bank's *World Indicators 2000* suggests more modest figures for urban Bangladesh and Pakistan but it gives similar figures for Zimbabwe, the Philippines and India. Both publications also suggest that many African nations other than Zimbabwe have urban populations that are relatively well served.

It is difficult to reconcile the figures for India in Table 10.2 with the profiles of provision for water and sanitation for many cities in India, which show that much less than 85 per cent of their population is adequately served with 'safe water' and much less than 70 per cent has adequate sanitation.[93] Similarly, it is difficult to reconcile the official statistic of 96 per cent of Pakistan's urban population with safe water in the UNDP Report (or the lower figure of 77 per cent in the World Bank report) with the documented lack of water provision for Karachi and Faisalabad since these two cities contain a sizeable proportion of Pakistan's total urban population. It is similarly difficult to see how 70 per cent of Ghana's urban population can have had access to safe water in the early 1990s, given the levels of water provision documented in Kumasi and Accra.

One particular example of unreliable statistics comes from Kumasi, Ghana's second-largest city. The official

Table 10.2

Proportion of the urban population reportedly having 'access to safe water' and 'access to sanitation' in selected countries, 1990–1996

Country	Statistics from the UNDP *Human Development Report 1996*		Statistics from the World Bank's *World Development Indicators 2000*	
	% of urban population with access to safe water	% of urban population with with access to sanitation	% of urban population with with access to safe water	% of urban population with with access to sanitation
Bangladesh	99	75	47	77
Burkina Faso	na	42		8
Ethiopia	91	97	90	n d
Ghana	70	53	70	53
India	85	0	85	46
Indonesia	79	73	78	73
Jamaica	na	100	92	89
Nigeria	63	40	63	61
Pakistan	96	62	77	53
Philippines	93	79	91	88
Sudan	84	79	66	79
United Republic of Tanzania	67	74	65	97
Uganda	47	94	47	75
Zimbabwe	99	9	99	99

Note: The World Bank figures are said to be the most recent year available in the period 1990–1996.

Box 10.3 The burden of water collection

Obtaining water often involves significant inconvenience in the time spent in collection, the physical effort required and negative health effects. In many ways, the burden of water collection for unpiped households seems to have increased during the last 30 years. These findings emerge from a follow-up on the first large-scale assessment of domestic water use and environmental health in Africa.[i] The study looked at the use of water for consumption, hygiene and amenities in household life. It also examined the cost of water in monetary terms as well as, less readily measured, amount of energy and time spent. It recorded information on per capita and total household water use, while identifying factors influencing variations in use and effects on health.

Who bears the burden?

As was the case 30 years ago, women bear primary responsibility for water collection. However, some changes have occurred. For example, there has been an increase in child drawers as well as in the number of males, notably teenagers, collecting water for commercial purposes.

Neither has the principal mode of transport changed. Women and children continue to walk to and from the source, carrying water on their heads using jerrycans and saucepans. As a consequence they are prone to experiencing health problems such as headaches, general fatigue and pains in the chest, neck and waist.

However, to a large extent, the mode of transporting water depends on the sex of the drawer. Among males there has been an increase in the use of bicycles and hand-driven carts. These are the principal modes used by vendors (75 per cent), enabling them to transport large quantities of water.

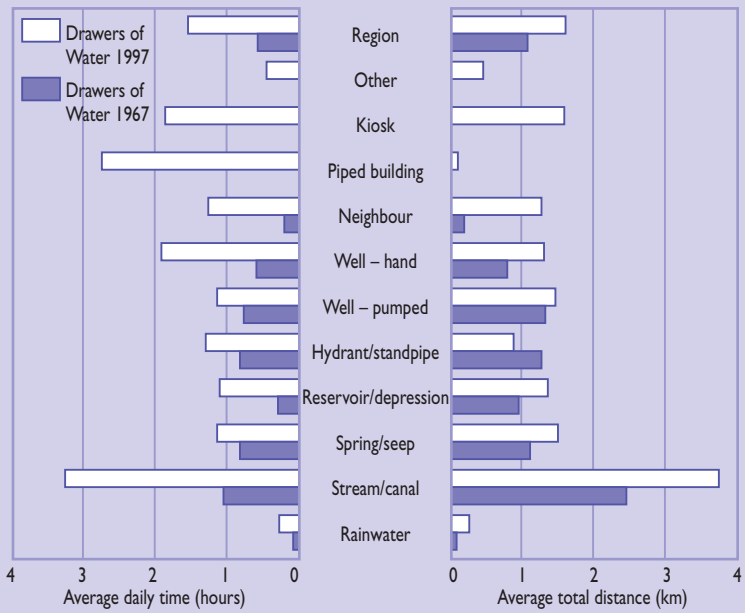
How many trips are made?

On average, the daily number of trips for water made per household increased from 2.6 in 1967 to 3.9 in 1997. This is largely due to the increase in water use by unpiped households.

How far are the sources?

Drawers can travel considerable distances to obtain water. On average the distance covered to collect the daily water for one household decreased slightly from 428 to 405 m. This decrease is in part due to the improved accessibility of protected sources such as hydrants, standpipes and wells. It also reflects the increase in vendors supplying water direct to the house. However, the decrease is not uniform. At some sites, households reported that sources that were previously available had dried up and as a consequence they had to walk longer distances to the next source.

Note: i White et al, 1972.
Source: Thompson, 2000.



Average daily time spent and distance travelled per household by primary source

figures suggest that 99 per cent of its population are adequately served with water.[94] However, a recent report states that although three-quarters of the Kumasi population is served with piped water, large numbers only have access through shared taps or standpipes; long waits and queues are common. Even where there is a piped network, water pressure is often inadequate and the service not continuous. Only 10 per cent of households have indoor plumbing. Water provision is particularly poor on the urban periphery where there is rapid urban growth.[95]

Often, a high proportion of those reported as having access to piped water have access only to public standpipes. Where water is only available at a public place – for instance a communal well or public standpipe – the quantity used by each household will be influenced by the time and energy needed to collect and carry water back to the home. Collecting water this way can be very time-consuming. It is common for 200 to 500 persons to share a standpipe and many government agencies regard this as 'adequate'. In one part of Dakar, Senegal, a survey in the late 1980s found that there were 1513 persons per tap.[96] In Nouakchott, Mauritania, only 179 standpipes were installed to cover the entire urban area, which meant an average of only one standpipe for around 2500 inhabitants.[97] In many areas of Luanda, Angola, there is one standpipe for 600–1000 persons.[98]

In one part of Dakar, there were 1513 persons per tap, while in many areas of Luanda there is only one standpipe for 600–1000 inhabitants. In Nouakchott, Mauritania, there was one standpipe for every 2500 residents

For those reliant on standpipes, the difficulties in getting the water are often much increased by the fact that water is only available a few hours a day; or water pressure is very low, so it takes a long time to fill up each person's water containers. It also requires much physical effort to carry water any distance. If a household keeps its water consumption down to only 160 litres a day (well below the minimum recommended level), this still means carrying a total weight of 160 kilos of water each day from the standpipe (or well) to the home. A recent study found that for many households in East Africa the burden of collecting water had increased over the last 30 years (Box 10.3).[99]

The assumption that households with piped water supplies are adequately served can also be questioned for many cities. Many piped water systems do not have water in them for much of the time. For instance, in Zaria (Nigeria), a survey in 1995 found that 11 per cent of those who had piped water received water one day in two, while 4 per cent received it once a week or once a fortnight, and 12 per cent rarely or never received water.[100] In Mombasa (Kenya), very few parts of the city have a continuous water supply (on average, it is available for only 2.9 hours a day); some parts of the city have had no water in the pipes for several years.[101] The availability of water supplies in several Indian cities, including Chennai/Madras and Hyderabad, deteriorated during the long drought of the early 1990s to the point where water was available for only two hours in

every 48. In Madras, the situation deteriorated further in 1993 to the point where water was only available every third day.[102] Even in India's capital city, Delhi, water supplies are intermittent for large sections of the population, including one-fifth that receives water for less than four hours a day.[103] Data on water provision from water utilities in 50 cities in Asia and the Pacific during the mid-1990s highlighted how many provided water for only a few hours a day including Karachi (four hours), Chennai (four hours), Mumbai/Bombay (five hours), Bandung (six hours), Kathmandu (six hours) and Faisalabad (seven hours).[104] In 26 of the 50 cities, the utilities claimed to provide water 24 hours a day but consumer surveys, drawing from 100 randomly selected customers in each city, suggested that the water utilities overstated the time for which water was available.[105]

Water provision in 50 cities in Asia and the Pacific was often for just a few hours per day, even though the utilities in 26 of these cities claimed to provide water around the clock

Thus, it is likely that tens of millions (and perhaps hundreds of millions) of urban dwellers, classified in official statistics as having 'safe water', still face great difficulties in obtaining clean and sufficient water for good health.

Sanitation

A comparable gap between reality and official statistics is also evident for sanitation. Official statistics suggest that by 1994, more than half the urban population in Africa had adequate provision for sanitation, as did two-thirds of the population of Asia and close to three-quarters of the urban population of Latin America and the Caribbean.[106] However, these figures cannot be taken at face value. For example, 100 per cent of Jamaica's urban population was said to have had sanitation by the early 1990s, but a report on Kingston, Jamaica's largest city, indicates that only 18 per cent of the population are connected to sewers; 27 per cent have soakaway pits, 47 per cent use pit latrines and 8 per cent report no sanitary facilities at all. Similarly, one cannot but wonder about the credibility of statistics showing high levels of sanitation provision in urban populations by the early 1990s in Zimbabwe (99 per cent), Uganda (94 per cent) and Ethiopia (97 per cent).

Some 97 per cent of Tanzania's urban population is said to have had access to sanitation by the early 1990s. However, this statistic cannot be reconciled with the many reports that detail the inadequacies in provision for sanitation in Dar es Salaam (see Box 10.4) which contains a considerable proportion of the national urban population. Likewise, the statistic for the Philippines cannot be reconciled with reports on provision for sanitation in Manila and Cebu.

One possible reason why official statistics exaggerate the extent of provision for sanitation is because they include any household that in the census or some household survey is said to have access to a public latrine as having 'adequate sanitation'. Thus, they include those who have to compete with 100 or more other people for access to each latrine and where maintenance and cleaning of public latrines is so poor that using the latrine itself is a major health hazard and many people avoid using it. For instance, 40 per cent of Kumasi's population is dependent on public latrines and thus officially classified as served with sanitation, even if many defecate in the open because they cannot afford the wait or the fee, or avoid the use of poorly maintained facilities.

In a low-income settlement in Nairobi (Mukuru village), before two public latrine blocks were constructed in 1996, there was only one latrine per 1000 persons.[107] In a low-income settlement in Kumasi, Atoinsu, there are 360

Box 10.4 Water supply and sanitation in Dar es Salaam: self-help and sustainable technology

Trunk and distribution losses from the city's water supply amount to about 60 per cent of pumped water. An additional 50 per cent is lost as tap losses and spills, resulting in a general water delivery shortage. Pipe breaks cause erratic water supply in several areas. Due to fast urban development, pipes are often installed in shallow trenches *after* the development of housing. They are often broken during road and house construction, causing ponding on the surface, which leads to destruction of roads by erosion and creation of swampy mosquito breeding areas where drinking water and sewerage from loose pipes are mixed, thus polluting surface water and groundwater. Many house connections are performed illegally with inappropriate technology and bad materials.

Only between 5 and 10 per cent of the population is served with sewerage. The system is very old and some sewers have collapsed due to lack of maintenance. About 75 per cent of the population uses on-site sanitation, consisting of pit latrines, septic tanks with soakaways, cesspits, soak pits, ventilated pit latrines or French drains. The adoption of modern sanitation models in the rapidly growing urban areas of Dar es Salaam has not been successful.

Dar es Salaam is a 'garden city' where many people grow vegetables in urban and peri-urban agriculture. Pollution of soil is, thus, another important problem threatening health.

Finding both central authorities technically and economically unable to improve water supply and sanitation, local citizen groups look for affordable ways of improving the necessary infrastructure. Local communities have formed organizations with elected members, such as the Kijiotoyama Development Community (KIJCO). Negotiations between KIJCO and the City Authority resulted in a Community Infrastructure Programme within which residents received assistance in construction of two deep wells as an alternative water source. Through self-help residents also provided technical input in the design and provision of the road and water network. Improvement of the water supply resulted in a reduction of the distance to water taps for most households.

In order to secure a sustainable water supply for the growing population in Dar es Salaam urgent steps should be taken towards pollution prevention of surface water, groundwater and soil. In order to make progress it is very important to establish better cooperation between water authorities and citizen action groups.

Local water authorities and citizen groups urgently need support in their actions, first of all in the form of information about alternative solutions. Water-borne sanitation is not the only or best option. Its costs exceed national economic capabilities, aside from the additional expense of constructing treatment plants. In Dar es Salaam freshwater resources are very limited and vulnerable, so it is important to introduce technologies that require much less water than traditional sanitation. Dry sanitation solutions, and especially separation sanitation, might save about 70 per cent of households' water use and would also recycle nutrients.

It is necessary to educate construction workers on proper installation technology and to provide house owners with information on proper use and maintenance. Community groups also need help in developing methods for the utilization of human excreta as fertilizer. Successful demonstration of the benefits of the dry- and nutrients-recycling sanitation approach will be good for the environment and improve the health of the population.

Source: Janusz Niemczynowicz, 2000 (see Background Papers).

Box 10.5 Women building toilets and government–community partnerships

In cities around India, communities within the National Slum Dwellers' Federation /Mahila Milan Alliance are building toilets, with a clear cost-sharing formula: communities design, build and maintain common toilets, while cities pay for building materials and provide sewer and water connections.

The Sabzi Mandi toilet project was a groundbreaker. For the Federation, it was a chance to test its toilet paradigm within the context of the Gomti project partnership. For the government, it was a chance to test the idea of community contracts.

Sabzi Mandi is a vegetable market just off the Pata Nala. To one side is a tiny settlement of 11 houses, clustered around a broken-down public toilet, whose crude, half-century-old plumbing channelled soil right into the *nala* (sewer lines). The toilet's location made it potentially useful for both community and public, but it needed rebuilding and the women were determined to do it. The Sabzi Mandi toilet was the project partnership's first community toilet contract.

With help from Mumbai Mahila Milan and funds for building materials from the British DFID, the Sabzi Mandi community demolished the old toilet, and built a new one in its place, with full sewer and water connections, 20 seats (including 10 special children's latrines) and 4 bathrooms. At Rs.5000 (about US$110) per seat, the toilet worked out to less than one-fifth what most cities spend building public toilets. The immaculate facility is managed by the women on a pay-and-use system, and has become a popular pit-stop for vendors, labourers and market-goers.

Source: SPARC, Mahila Milan and the National Slum Dwellers' Federation In India, 1998.

persons per squathole.[108] In most Indian cities, a considerable proportion of low-income households have no provision for sanitation in their home. A survey in Pune (India) found that in the worst-served settlements, there was just one toilet stall per 2500 inhabitants.[109] In Delhi, a 1990 survey showed that the 480,000 families in 1100 'slum' settlements had access to only 160 toilet seats and 110 mobile toilet vans.[110] Tenements, cheap boarding houses or other forms of cheap rented accommodation often have the worst provisions for sanitation or no provision at all. It is difficult to get landlords to invest in sanitation, especially where their tenants have very low incomes and the landlords' profits come from squeezing as many tenants as possible into rooms within shacks that required very little investment to build. Households with no provision for individual or shared sanitation within their homes have only three possibilities: public toilets, defecation outside or defecation into some container which is then thrown away (what in some cities is called 'wrap and throw' or 'flying toilets'). Among the cities where open defecation is reported to be common for significant proportions of the population are Accra, Addis Ababa, Ahmedabad, Bangalore, Bhilwara, Cebu, Colombo, Dhaka, Kingston, Kumasi and Ouagadougou, as well as large sections of the population in other cities in India.[111] For instance, in Ahmedabad, an estimated half a million people defecate in the open.[112] These sorts of conditions have given rise to community-based toilet building projects (see Box 10.5) that in the case of the Alliance in India have been inaugurated in 'Toilet Festivals' (*sandas mela*) that are at once carnivalesque and empowering and help to direct attention to much needed sanitary improvements.[113]

Thus, there are strong grounds for doubting the accuracy of official statistics on provision for sanitation in urban areas, as well as for water. If our concern is to significantly reduce the health burden associated with inadequate provision for water and sanitation, then the criteria as to 'what is adequate' need to be changed. There is some research on which to draw; for instance, a study of the association between health and provision for water and sanitation in Betim (Brazil), which emphasized how it was not only the availability of water and sanitation infrastructure that influences health but also water quality, per capita consumption, regularity of supply, extent of indoor plumbing and provision for drainage.[114]

It is not only the availability of water and sanitation infrastructure that influences health, but also water quality, per capita consumption, regularity of supply, extent of indoor plumbing and provision for drainage

The difficulties plaguing official statistics on urban provision also means that existing 'rural–urban' comparisons should be questioned. If the extent of provision for urban populations is greatly overstated, the magnitude of the rural–urban gaps may in fact be much less. In addition, urban households lacking provision for sanitation may face a significantly higher health burden because higher densities and larger populations make it more difficult to dispose of excreta and wastewater in ways that ensure no possibility of human contact. It is also more difficult to safeguard local water sources from contamination. Urban populations may face much greater difficulties than rural households in getting access to a communal standpipe because there are far more people competing with them for access to that standpipe. Defecation in the open may be less problematic in rural areas as places are available for open defecation that limit the risk of human contact with the excreta and that pose less threat of harassment for women. Urban populations may be more willing and able to pay for improved provision than rural communities for several reasons. Many urban populations have higher monetary incomes, they face larger direct and indirect costs of inadequate provision, and because efficient water and sanitation providers can take advantage of economies of scale to reduce the costs of individual house connections. While water supply is both a rural and an urban issue, sanitation is primarily an urban issue.

It is clear that provision for water and sanitation is also very inadequate for much of the rural population. Further, it may be that official statistics for rural areas also exaggerate the quality and extent of provision. However, the discussion of priorities for water and sanitation should not turn into a fight between rural and urban proponents. What need to be recognized are key differences in rural and urban contexts and their implications for forms of water and sanitation provision that best meet people's needs.

We must recognize key differences in rural and urban contexts and their implications for forms of water and sanitation provision that best meet people's needs

Notes

1 The introduction to this chapter draws from *Water & Megacities*, jointly released by UNEP and UNCHS (Habitat) on 19 March 2000, on the occasion of the second World Water Forum and Ministerial Conference, 'From Vision to Action', held in the The Hague, The Netherlands, 17–22 March 2000. See www.worldwaterforum.org/.

2 This part and the following chapter sections on gaps and implications are adapted from a background paper prepared by James L Wescoat Jr (2000), University of Colorado.

3 eg Black, 1998; Cairncross et al, 1990; WASH, 1993.

4 UNCHS, 1996, Table 16.

5 US Department of Housing and Urban Development, 1999.

6 Gleick, 1998a, b.

7 Jonsson and Satterthwaite, 2000.

8 IRC, Source, April 2000.

9 *Water & Megacities* (see Note 1, supra).

10 Boot and Cairncross, 1997.

11 See www.irc.nl/index.html.

12 Srinukoon, 1999.

13 Hasan, 1992; 1993; 1997a, b; Khan, 1994.

14 Pathak, 1999.

15 Chaplin, 1999; Michel, 2000.

16 Pathak, 1999.

17 Race, *Poverty and Enviroment*, 1992.

18 Pulido, 1996.

19 Eg the GENPAK information package; Wijk-Sijbesma, 1998.

20 Hemmati and Leigh, 2000.

21 See www.un.org/esa/sustdev/wedo.htm.

22 WEDO, 1998.

23 Halvorson, 2000; Jordan and Wagner, 1993; Wijk-Sijbesma et al, 1996; Wijk-Sijbesma, 1998.

24 Halvorson, 2000.

25 Mitchell, 1998.

26 For exceptions, see Venkateswaran, 1996; Hasan, 1997a, b; Hasna, 1995.

27 IRC, 2000.

28 Hasan, 1993; 1997a, b.

29 Alfaro et al, 1998; Bauer, 1998; Briscoe, 1997; Crane, 1994; Katakura and Bakalian, 1998; Rees, 1998; World Bank, 1999d.

30 Dinar and Subramaniam, 1997.

31 Barlow, 1999.

32 Briscoe, 1997.

33 Beecher, 1994; Burns et al, 1995; Drakeford, 1997; Johnstone, 1997; Middleton and Saunders, 1997; Perchard, 1992; ID21, 1998.

34 AWWA, 1991; Saunders, et al, 1998.

35 Bella S Abzug quote; OFWAT, 1995.

36 Huby, 1995; Lister, 1995; Mara and Schweiger, 1996.

37 Cf. NRC, 1997.

38 US Department of Agriculture, 1998ab; US Environmental Protection Agency, 1998.

39 Eg Marino and Kemper, 1999; cf Swyngedouw, 1995.

40 Daniere and Takahashi, 1999.

41 Colten, 1992; NCLC, 1991; Saunders et al, 1998; Wescoat and Halvorson, 2000. A recent paper offers a detailed discussion of criteria that must be considered in plans for privatized provision of water and sanitation in ways that best meet the needs of low-income households, particularly in informal settlements; see Hardoy and Schusterman, 2000.

42 Chaplin, 1999; Heller, 1999.

43 Solo, 1999; Wegelin-Schuringa and Kodo, 1997.

44 Ingram et al, 1995.

45 de Veer, 1997.

46 See *Habitat Debate*, special issue on Water (October 2000), available at www.unchs.org.

47 Other water and sanitation variables [eg per cent access to water and sanitation] are addressed under the heading of 'economic development'.

48 Costanza et al, 1992.

49 Eg Joardar, 1998; McGranahan and Kjellen, 1997.

50 Simpson-Hebert et al, 1998.

51 Smit and Nasr, 1992.

52 UNEP/IETC, 1999.

53 Agarwal and Narain, 1997.

54 Brooks, Rached, and Saade, 1997; cf Dietz and Ranton, 1996; cf in Asia, ESCAP, 1998; Esrey et al, 2000.

55 Environmental Planning Collaborative, 1998.

56 Gleick 1998a, b.

57 Wescoat, 1995.

58 An early essay by Gilbert White (1974) explored these views of water as a 'right' or 'good'.

59 Wescoat and Halvorson, 2000.

60 White et al, 1972.

61 Thompson, 2000. See also Box 10.3.

62 Wescoat, 1993.

63 Orangi Pilot Project, 1998.

64 Arifeen and Mahbub, 1983; Hoque et al, 1994.

65 Verma, 2000.

66 Verma, 1999; 2000.

67 Anon, 2000.

68 Le Jalle, 1999.

69 World Bank, 1999e; Yepes, 1996.

70 WASH, 1993.

71 Cotton and Haworth, 1995.

72 See http://info.lboro.ac.uk/garnet/.

73 Eg WEDC, 1999.

74 See www.irc.nl/index.html.

75 IRC, 2000.

76 Eg UNCHS (Habitat), 1996 (Beijing), and 1997 (Cape Town)

77 UNCHS/UNEP, 1999.

78 Jonsson and Satterthwaite, 2000.

79 See www.urbanobservatory.org/indicators/database/pdf/infrast.pdf.

80 Eg Audefroy, 1995; Kjellen, Bratt and McGranahan, 1997; and Sandelin, 1994.

81 See Goldblatt, 1996; and Macy, 1999 for a broader discussion of southern Africa.

82 UNCHS 2000; Yepes, 1996. NUREC is a nonprofit-making international association of institutional organizations and individual members. Its home page is www.uni-duisburg.de/duisburg/nurec.htm

83 Anderson, 1988; Melosi, 1994; Rosen and Keating, 1991.

84 Eg Davies, 1989.

85 See Women's Environment and Development Organization, www.un.org/esa/sustdev/wedo.htm.

86 The rest of this chapter is drawn from the paper, 'Overstating the Provision of Safe Water and Sanitation to Urban Populations: A Critical Review of the Quality and Reliability of Official Statistics and of the Criteria Used in Defining What is "Adequate" or "Safe"' prepared by A Jonsson and D Satterthwaite of the International Institute for Environment and Development (IIED), London, for presentation at a meeting of the Panel on Urban Population Dynamics of the National Academy of Sciences, 5 May 2000, Washington, DC.

87 This point was discussed in Cairncross, et al 1990. It was also developed in Satterthwaite, 1995b.

88 WHO and UNICEF, 1994.

89 UNDP, 1996a, pp 152–153.

90 Ibid.

91 The development of internationally standardized indicators is an attempt to deal with this difficulty, although agreement in this regard is by no means a guarantee that the data, thus collected and reported, will validly represent actual conditions.

92 Rakodi et al, 2000.

93 See for instance UNICEF (1995-6) 'Multi indicator cluster surveys in India 1995-96, urban slums and the right to privacy: Individual toilets, bathing area'. *Urban Poverty*, April-June 1997, page 11. (Article from Women and Sanitation: 'The Urban Reality Experiences of Government Programmes/NGOs/CBOs'. R Khosla, Training Co-ordinator, NIUA National Workshop on Women, Children & Sanitation, 10–11 April 1997, New Delhi.)

94 Living standards survey quoted in Devas and Korboe, 2000.

95 Korboe et al, 2000.

96 Ngom, 1989.

97 Azandossessi, 2000.

98 Development Workshop (1995) *Water Supply and Sanitation and its Urban Constraints: Beneficiary Assessment for Luanda*.

99 See also Thompson et al, 2000.

100 Centre for African Settlement Studies and Development (CASSAD) (1995) 'Urban Poverty in Nigeria: Case Study of Zaria and Owerri, Cassad, Ibadan'.

101 Rakodi et al, 2000. The 1993 estimate was from UNCHS (Habitat) (1997) *Analysis of Data and Global Urban Indicators Database 1993*, UNCHS Urban Indicators Programme, Phase 1: 1994-6, Nairobi. The results of the household survey came from African Medical Relief Fund (AMREF) and Office of the Vice-President/Ministry of Planning and National Development (1997) *The Second Participatory Assessment Study – Kenya Vol. 1*, Nairobi. As part of the national study, Mombasa district was selected for in-depth assessment as an example of an urban district. Other data drawn from Gibb (Eastern Africa) Ltd (1995) *Sewerage, Drainage and Sanitation Studies Strategy Study, Appendix E, Sanitation Options and Strategies*, Report for the National Water Conservation and Pipeline Corporation as part of the Second Mombasa and Coastal Water Supply Engineering and Rehabilitation Project, Nairobi, p E/2.

102 Giles and Brown, 1997.

103 Ibid.

104 Asian Development Bank, 1997.

105 Ibid

106 WHO and UNICEF 1994.

107 Wegelin-Schuringa and Kodo, 1997.

108 Devas and Korboe 2000.

109 Shelter Associates (1999) *Primary Survey*, Pune.

110 Chaplin, 1999.

111 Multi Indicator Cluster Surveys in India 1995-96, Urban Slums, UNICEF.

112 Dutta, 2000.

113 See Appadurai, 2000. See also Hobson, 2000, and Chapter 14.

114 Heller, 1999.

CHAPTER 11

IMPACTS OF RECENT TRENDS ON URBAN TRANSPORT[1]

Cities have always competed regionally and globally with one another. What is new is the extent to which a city's economy can contribute to globalization, and how much of a city's economy can be oriented to that bigger arena. The transport component of human settlements influences the course and outcomes of globalization but is itself affected by globalization as well. These reciprocal impacts can only be understood by better insights into the changing priorities of urban form and infrastructure in relation to globalization processes.

Transport and Urban Form

Historically, transport system developments have helped to shape urban form.[2] For example, in many of the more developed economies, dense, mixed-use 'walking cities' predominated to the mid-19th century, corridor-based 'public transport cities' emerged from the industrial revolution, and dispersed 'automobile cities' grew with the car from the 1940s. Now, as we enter the new economic era of the global knowledge economy where ICTs are increasingly dominant, the question is how these changes will impact on cities and their transport priorities.

Simplistic notions about global information technologies, first put forward during the 1960s, suggested that the impact on cities would be to create 'community without propinquity', to disperse people into 'non-place urban realms' or exurbs, where they only needed to telecommute.[3] With a growing awareness that telecommuting is not significantly replacing travel,[4] the complex role of ITCs in shaping cities has been assessed in a more subtle and nuanced way. Modern information technology, like the telephone before it, reduces the need for face-to-face interchange in some activities but cannot replace many of the quality human interactions critical to economic and cultural processes.[5] 'The new world of information technology will largely depend, as the old world did, on human creativity; and creativity flourishes where people come together face-to-face.'[6]

Various theories have emphasized that 'local milieux' of the global economy will emerge,[7] that local culture will be strengthened as globalized information makes national borders less relevant,[8] or that the importance of face-to-face contact will ensure centres emerge as critical nodes of information-oriented production.[9]

Information technologies could be associated with the concentration of urban activities into nodal centres, rather than leading to the dispersal of cities, based on a combination of:

- The shifting of intrusive industrial production out of urban centres to allow clustering of information-oriented jobs.
- The need for integration of specialized disciplines to solve most global economy issues, encouraging face-to-face interaction between professionals for critical phases of any project.
- Easy access to the purchase of the extra choices provided in quality urban environments by those with the wealth created by being part of the global economy.

Whether such places will be in central/inner city centres or edge city centres[10] becomes an important consideration. The future city will probably be multi-nodal, organized around information technologies, and have distinct sub-centres with a particular cultural and economic identity. The city with just one major centre (CBD) will become less and less prevalent. Other agendas like social justice, sustainability and particularly automobile management, in urban areas, need to be assessed in the light of these likely changes in urban form and function. In this regard, recent studies[11] indicate the following trends in transport sector developments.

Wealthy Cities are Slowing Down in Car Use

In the late 1980s, regional scientists began to speculate that the sprawling US and Australian cities would begin to stabilize growth of car use.[12] This was expected due to dispersal of work to the formerly residential suburbs leading to a reduction or stabilization of journey-to-work distances. This stabilization was seen as the 'self-regulation' of the car-based city, and therefore old ideas about public transport could now be discarded. The conclusion that low-density sprawl, particularly random suburbanization of workplaces, may lead to reduced car use, was used to justify the continued sprawl and lack of public transport options in these cities.

Similar patterns of slower car growth are observable in Canadian cities and in the European cities where reurbanization is also apparent. For example, Stockholm had a per capita decline in car use (229 km) between 1980

and 1990. Its per capita public transport use grew by 15 per cent in this period and at the same time, it increased its density in the city centre, the inner area and the outer suburbs through various innovative compact developments. Table 11.1 shows the growing share of the developing countries in the world's total fleet of motor vehicles.

Year	Low- and middle-income countries		High-income countries		Total motor vehicle fleet
	(millions)	(%)	(millions)	(%)	(millions)
1995	164	25	487	75	651
2000	209	27	565	73	774
2010	340	31	759	69	1,099
2020	555	35	1,020	65	1,575
2030	905	40	1,370	60	2,275
2040	1,470	44	1,840	56	3,310
2050	2,400	48	2,475	52	4,975

Source: American Automobile Manufacturers Association, 1996.

Table 11.1
Projected growth of global motor vehicle fleet by national income level, 1995–2050

Public Transport is Growing Nearly Everywhere

The data show considerable differences in commitment to public transport. The limited data on trends indicate that the US and Canadian cities were virtually static in public transport use and system growth during the 1980 to 1990 period, while Australian cities grew a little. Meanwhile, European cities showed 15 per cent growth from their already high levels, and in wealthy Asian cities the growth figure was 11 per cent. Zurich, for example, grew by 171 trips per capita in the 1980s to reach a level of 515 trips per person per year. The average total trips per capita in Australian cities is 92. In fact, the average public transport trips per capita *growth* in European cities from 1970 to 1990 is more than the *total* per capita public transport use in US cities and is similar to the total trips per capita in Perth, Adelaide and Brisbane. Growth in public transport in European cities has increased at an accelerating rate.

Although some commentators have suggested that the world of ICTs would somehow leave public transport behind as an old technology that is part of another era,[13] transit systems remain a vital part of any city in the new global economy. In fact, ICTs can be used to upgrade transit systems. With the maturation of 'intelligent transport system' technologies, reliable and responsive public transport services are ever more possible. Mass transit vehicles can deviate to carry people to their door at night, request times for service by those with disabilities can be shortened and so on. The possibilities are many and agencies around the world are increasingly sharing their successes.[14]

Transport and Social Exclusion

Cities in the more developed economies

Recent evidence shows that most wealthy cities which are part of the global information age are reconcentrating around urban centres. Not only are many cities now increasing in density (after a century of declining densities), but it is also becoming apparent that the more global the city's economy, the more it is concentrating into these nodes.

This process has led to an urban renaissance in the old central areas of many cities. The reurbanization process is evident in Canadian and European cities, as well as in the US, despite significant job and population loss in American cities in previous decades. The reurbanization of US cities is also underway, but the next decade will show if this fully follows the more global trend to reconcentrate the city. The transport impacts of this process, as shown above, are generally favourable as it can reduce car use per person and favour public transport, but it can also leave large suburban areas excluded from the new economy and its services.

Strategies to deal with the new economic geography of wealthy cities need to include:

- ways of bringing jobs of the global economy to the suburbs through urban design of centres that create the interchange networks required by the new economy;
- new rapid transit that can link the suburbs and the new centres;
- social housing near places of employment to reduce the need for travel by lower-income groups.

Cities in the developing economies

The development of new economic opportunities and new technologies in many cities worldwide are widening social and economic inequalities (see Chapter 1). This situation is even worse in the metropolitan areas of developing countries, where the labour market is mainly located in the core and many of the poor live in peripheral areas. Even if participating in the labour market, either formally or informally, travelling can still be a significant time and financial burden (up to four hours a day may be spent commuting, and up to a third of poor workers' earnings may be spent just on commuting costs). Economic exclusion often leads to the spatial segregation of social groups in areas with inferior housing, lack of educational opportunities, health care, leisure and amenities and isolation from other areas. Those most likely to be isolated socially are those without access to good transport.

A majority of the world's population does not have access to a private car. Car-dependent systems also isolate the young, the elderly, many women and anyone else who does not drive or have access to a car. Public transport still remains the principal means by which motorized travel takes place in most cities worldwide – the bus accounts for 80 per cent of all trips in Bogota, 75 per cent in San Jose, 61 per cent in Tunis. In cities with rapid rail transit the bus share is lower: London, 23 per cent; New York, 14 per cent; Paris, 8 per cent; and Tokyo, only 6 per cent.[15]

The world's 5850 million person population shares a total vehicle fleet of approximately 500 million cars, or 11 people per vehicle on average. However, the most mobile

countries have a ratio of only two to three people per vehicle (EU, US and Japan). In the rest of the world, the ratio is around 35 people per car, but the figure can be as high as 500 to 1000 people per car in countries such as Malawi, Burkina Faso or Ethiopia.[16]

This inequality in levels of motorization and public transport provision has major implications; it reflects conditions and policies that provide some segments of society with access to jobs and facilities, while excluding others from employment and services needed for a good quality of life.

Lack of access to transport can lead to four types of social exclusion, which tend to reinforce each other: spatial, temporal, personal and economic.

- *Spatial* exclusion usually occurs in low(er)-density areas where public transport operation is not financially viable, or in urban peripheral areas where services are less frequent or demand for services is often higher than supply. In developed countries, this is mostly felt in rural areas, many of which have no link by public transport at all, making the car the only feasible mode of transport. However, spatial exclusion may also affect low-income urban populations as found in distressed inner-city areas in the US and run-down peripheral housing estates in European cities.
- *Temporal* exclusion refers to the problems faced by travellers mainly late at night or very early in the morning and often at weekends when service is nonexistent or infrequent.
- *Personal* exclusion is based on individual characteristics such as gender, age, ethnic background and religion, illness or disability that may constrain people's mobility and access to transport, whether private, public or non-motorized forms such as walking and cycling.
- *Economic* exclusion refers to the inability of people to pay for transport costs.

In developed countries, spatial, temporal and personal exclusion may be more common among its citizens; in developing countries the main source of exclusion lies in spatial segregation and the inability of individuals to pay for transport. These last two factors can combine to create a spiral of exclusion that will eventually include temporal and personal exclusion as well.

Social exclusion in a broader context is much more than just poverty, deprivation and inequality. Social exclusion is the short-hand term for what can happen when people or areas suffer from a combination of inter-related problems such as unemployment, poor skills, low incomes, poor housing, high crime, bad health and family breakdowns.[17]

Box 11.1 Eliminating gender inequality in transport

Men have better access than women to superior transport modes, whether this is more regular use of the family car or more disposable income to ride a bus instead of walk. This 'gendering' of transport results from women's greater domestic responsibilities coupled with their lesser access to household resources. Transport deprivation may take the form of women forced to use inferior modes; their journeys having multiple purposes (unlike those of males who more typically just commute to work); customary or legal restraints on their rights to travel or to use a particular mode of transport; or physical harassment (see Box 11.2).

Many families have to make difficult choices about who will make the more expensive motorized trips and who is relegated to cheaper and less convenient modes of transport. As any decision of this sort reflects existing power relations in a family, its outcome is often determined by age and sex. Quite frequently, the male head of household will travel by public transport leaving female household members to walk. The inequality in this arrangement is heightened because in many cultures women are prohibited from riding a bike or using other non-motorized modes of transport, although doing so would ease their travel burden.

Women tend to have shorter journeys between work and home but they make many more trips than men to serve the needs of children, the elderly and other household members. In every age and income group, women make more of the shopping and other family business trips. In lower-income households where only one car is available, men tend to use the family car for work trips while women are dependent on public transport. Yet, complex household and caretaking responsibilities usually force women to make multiple stops. This also often makes travel more costly since they must pay for multiple single-fare tickets.

Despite the now almost universal recognition that women's domestic load, often in combination with low paid or unpaid work off the peak, leaves women both time- and resource-poor, the implications of this situation for transport and travel have largely been ignored. Transport planning, transport infrastructure design and transport management have historically been geared to servicing peak demand during rush hours, catering to more regular travel patterns to and from places of work. Development projects all too frequently ignore women's lack of mobility, which also hinders women's participation in project planning and design. Improving women's access to resources not only reduces gender-based inequities, but also has broader economic implications. The removal of impediments in women's daily travel needs is an important component of poverty eradication strategies.

Notes: For a series of case studies and projects concerning gender and transport, see the World Bank web site www.worldbank.org/gender/transport/. For a recent review of gender-related issues in transport and mobility in more developed economies, see R Law, 1999.

Poorer Cities are Being Trapped in Traffic

Most cities in the developing world moved dramatically from being dense, mixed-use walking cities into the era of the automobile, and now into the era of ICTs. This transition happened so quickly that few developing country cities had an opportunity to build a public transport city base as did the cities of the industrial world. These cities remain very dense apart from a few wealthy suburbs on the fringe, but now have traffic levels which, although small on a per capita basis, are very high in terms of the available space. This means they tend to be plagued by the worst levels of air pollution and road accidents in the world. Mitigation of the daily impact of traffic in such cities presents difficult urban development challenges.

Many Asian cities are more than ten times denser than, for example, US and Australian cities and so cannot be considered auto-dependent in the same way as the dispersed cities of the West. However, the poorer cities of Asia are saturated with automobiles and have a kind of auto-dependence that is based on the lack of adequate alternative modes of transport. Despite being seven times less wealthy, the newly industrializing Asian cities actually have a slightly higher level of car use than the wealthy Asian cities; further, they do not have nearly the same level

of public transport use, which in the wealthy Asian cities satisfies over 60 per cent of all the motorized transport needs. The Asian cities with successful public transport systems have retained their compactness and channelled their transport needs into this form of transport. They also have relatively high levels of walking and cycling (eg Tokyo's residents make 42 per cent of total daily trips by non-motorized means).

The newly industrializing Asian cities are becoming dominated by their traffic problems and tend to invest in large roads in an attempt to solve them. The belief that they can build their way out of congestion, rather than building public transport systems appears to be fostered by the advice they are given, which is predominantly a globalized transport policy that currently does not favour mass transit.[18] This was also the case with cities like Singapore, which built its mass transit system in the late 1970s and early 1980s against advice from the World Bank. Its success has helped to enable them to plan a multi-centred city suitable for the new economy. Many poorer cities now face the challenge of determining how to best use their limited capital to solve their transport problems while not harming their economies as they battle to attract investments from around the world.

There are three reasons for a renewed emphasis on mass transit systems in these cities. First, their urban form lends itself to public transport: not only are these cities compact, they are also invariably developed along very dense corridors that are ideal for rapid transit. Thus investment in rail systems could produce dramatic improvement to their traffic situations. Their urban forms are also characterized by mixed land use patterns, which favour high levels of non-motorized local trips. However, the traffic and environmental problems in these cities, as well as lack of investment in non-motorized infrastructure, are forcing pedestrians and cyclists off the streets. In China and many other developing nation cities, there is a conscious policy of exclusion of cyclists and rickshaws from certain areas on the grounds that they are a congestion nuisance. Additionally, there may also be gender-based discrimination, prohibiting women from riding bikes.

Second, an alternative commonly presented is that incremental improvement in bus fleets will be a better investment than a rail system. However, this is often compared with very expensive above- or below-ground metro systems rather than surface rail systems. Further, data from around the world show that only public transport systems with a speed advantage can compete with private car use.

The traffic speeds in the poorer Asian cities are very slow but their bus-based transit systems are much slower (Table 11.2). In Bangkok, the traffic averages a mere 13 kmph but the bus system averages only 9 kmph. Buses stuck in traffic do not offer a solution to these cities for their traffic problems. Bus systems must be upgraded, but by not allowing mass transit financing in poorer cities, the global transport policy community is condemning these cities to a future of car dependence where they cannot compete to attract global capital.

Box 11.2 Buses for women only in Bangkok

In May 2000, the Bangkok Mass Transit Authority (BMTA), a state-run bus operator in the Thai capital, began service for what was dubbed 'The Lady Bus'. The initiative came in response to numerous complaints by women about safety. Women, reacting to sexual harassment and crimes while commuting, had been demanding a safer travel option during rush hours. The Lady Bus accepts only women as passengers, except for accompanying sons aged less than 15 years. Bus drivers and fare collectors on the Lady Bus will be male because the BMTA wants them to protect passengers in case of emergencies.

The Lady Bus runs as every third bus on ten routes on the 30th, 31st and 1st of each month, between 4 pm and 9 pm. BMTA chose the evening and night trips during salary payment dates for introductory services because these are the riskiest times for women passengers to become crime victims. The ten introductory routes run past crowded business centres in the Thai capital, including Victory Monument, Maboonklong and Siam Centre. The number of routes and frequency of service will be increased if the BMTA finds that the project works.

Source: *Japan Economic Newswire; Kyodo News Service*, 30 May 2000.

Box 11.3 Urban transport and poverty

Within one generation, the developing world's urban population will double in size. Population growth translates into increased numbers of motor vehicles. Thus, during the past decade, the growth rate of motor vehicles has been very high in the urban areas of developing countries and it is expected to be higher in the years to come. For the urban poor, issues of urban transport are becoming of critical importance. Transport is an essential component of urban life, but it is often a major physical burden for the poor because it can account for a large part of their monetary income and time. The complex urban transport problems in many developing countries are triggered by a number of interrelated trends: urban population growth; land use mismatches; and underinvestment in non-motorized transport (NMT).

In Asia, most of this growth stems from increases in the number of two- or three-wheeled motorized vehicles. The mobility and affordability advantages of such vehicles are diminished by their pollution disadvantages. The environmental, social and financial impacts of current transport trends are significant: Motorized transport produces more air pollution than any other human activity and in congested city centres traffic can be responsible for 80–90 per cent of nitrogen oxides and hydrocarbons and a large portion of the particulates. In the cities of many developing countries, ambient lead levels greatly exceed health standards.

The development of the urban form is a second factor at the heart of many transport problems around the world. Increasing urban sprawl is disadvantaging public transport supply and reducing access, especially to those forced to peri-urban settlements outside the range of existing urban facilities. Transport problems have a disproportionate impact on the urban poor, while poor women are especially badly affected. Women often carry the lion's share of poor families' transport burden, and services at convenient times and at prices they can afford rarely exist. This reduces their productivity and capacity to meet their families' needs. As a result, everyone suffers: economically, physically and socially. Adequate transport is a necessity but not the panacea to poverty reduction. More transport does not necessarily result in less poverty. However, inadequacy of transport and infrastructure and misguided transport interventions will almost invariably affect the poor most and encourage social segregation and a spiral of exclusion.

The third factor is that NMT, although the main mode of transport in many developing countries, it is often associated with poverty and economic failure and therefore seen as something that countries should aim to develop out of rather than cultivate and improve. Thus, planning for NMT frequently sacrifices the needs of the poor in favour of planning for a faster flow of vehicles. However, the majority of the world's population does not have access to motorized private transport and probably never will. NMT will therefore remain prevalent and should be viewed as a highly viable option if there is a suitably high population density, sufficient NMT infrastructure and a mixed land use development pattern.

Cities	Average speed (km/h)			Relative speed of transit to traffic
	Car	Train	Bus	
New York	38	39	19	0.89
Sydney	37	42	19	0.91
Vancouver	38	42	20	0.67
Zurich	36	45	21	1.24
Tokyo	24	40	12	1.58
Bangkok	13	34	9	0.70
Seoul	24	40	19	1.07

Source: Newman and Kenworthy, 2000.

Table 11.2

Average speed by mode and relative speed of public transport to traffic in selected cities, 1990

Third, cities' economic problems will only be aggravated by the policy of creating higher capacity roads. Car-based 'solutions' to urban transport favour the urban elites over the many who do not own a car. It is often the highway construction and car lobbies that are behind the building of the roads.[19] Although this may bring some investment into the automobile industry, it does not advance fundamental solutions to urban transport problems and worsens sustainability problems of environmental quality and limited non-renewable resources, while also exacerbating existing inequalities in access to jobs, schools, shops, services and community facilities.

Reducing Car Dependence

The patterns reveal that those cities with the most automobile dependence have the highest overall costs for their transport systems. They spend the most on roads, have the most heavily subsidized public transport systems, face the highest indirect costs from factors like transport deaths and pollution, and overall must commit a higher proportion of their city wealth for the non-productive purpose of passenger transport.

Still, many commentators on global city urban form have expressed a belief that car dependence is unavoidable for a city to be competitive. They argue that the trends in such cities indicate an overwhelming dependence on the private car and thus public transport will only be able to service a shrinking proportion of total trip demands.[20]

The evidence shows, however, that there is no techno-economic imperative for a city in the new global economy to be more car-dependent. The capacity of traffic systems and road space is reaching the saturation point in many cities. Average journey speed for motorized individual traffic is nearly down to that of pedestrians in some places. The goal of future development should be decoupling: that is, maintaining economic growth but with less car dependency.[21] If this can be achieved, economic growth could be maintained without the burden and the negative impacts caused by growth in motorization levels and road traffic.

Technology and information may well play a key role in reducing travel demand, or at least its rate of growth. In the more developed economies, there is some potential to replace motorized travel by activities that can be done from people's homes. For example, shopping through the internet is growing by leaps and bounds, which may decrease the number of trips people make to stores. Telemedicine schemes like 'First Help' facilitate self-diagnosis, which may reduce the need for visits to clinics.[22] Likewise, telecommuting may help to ease traffic congestion. For example, according to a recent estimate, the number of telecommuters in Tokyo will grow to between 9 and 14 million by 2010, reducing pressures on roads and public transport systems with associated cost savings of up to 25 per cent of annual spending on public transport.[23] However, as reviewed in Chapter 1, such changes will be restricted to more affluent population groups and further marginalize excluded groups.[24] By and large, these developments are also immaterial to the situation in the developing countries.

A major global challenge is the mismatch between supply and demand for transport due to population growth as well as urban sprawl. In developing countries in particular, population growth rates have been higher than the growth of transport provision, especially public transport. However, a slowing down of car use and increase in public transport use is occurring. Cities in the new global economy may indeed be able to assist the sustainability agenda, but only if infrastructure priorities enable them to progress in less car-oriented ways.

Promoting bicycling and walking transport policies can play a useful role in promoting individual health, decreasing pollutant emissions, reducing accident rates and easing traffic congestion. Yet, in most countries, the modal share of the bicycle is still low; for example, on average only 5 per cent of all trips within EU-member states are made by bike. The proportion is lower still in the US, Canada, Australia and other automobile dependent countries.

However, in some countries the modal share of bicycle trips is much higher. For example, it is 18 per cent in Denmark and 27 per cent in The Netherlands; the average Dutch person cycles 850 km a year. In the provincial capital of Groningen, 50 per cent of all trips in the city centre are made by bicycle. In China, non-motorized transport still remains a predominant means of personal mobility. In Shanghai, public transport and bicycles are the two main modes of transport, with a fleet of some 6500 buses and trolleybuses distributed over a city-wide network of 327 routes handling an annual ridership of 5700 million passengers. At the same time, 3.5 million bicycles are in circulation in the urban area, accounting for 40 per cent of all commuting trips (an equivalent of one bicycle for every 2.2 inhabitants); the car accounts for only 3.5 per cent of all journeys.[25] In Beijing, 71 per cent of all daily trips are on foot or bicycle.[26]

Increasing safety and convenience is key for encouraging more cycling and walking. Cycle use has been boosted significantly in European cities such as Basel, Graz, Hannover, Münster and Delft, after traffic conflicts were minimized through the implementation of traffic calming schemes and dedicated bike lanes. Short automobile trips are the most frequent and most polluting, and many could be easily shifted to cycling or walking. For example, in the UK, 72 per cent of all trips are made by car, of which 59 per cent are less than 8 km. Further, some places in the US have seen increased bicycle use after the installation of bike racks on city buses, allowing commuters to combine cycling and public transport on longer trips.

Globalization is creating different transport challenges in the poorer cities of the world. They are filling rapidly with cars as their urban elites begin to be international consumers, but their urban forms were not designed to cope with the growing demands of traffic. Further, despite having dense population corridors well suited to support mass transit, they are being discouraged from investing in these systems by the global transport policy community, which instead advocates high-capacity roads. The lack of an adequate public transport system will keep poorer cities trapped in traffic with little chance of competing for global capital. However, it is possible that a new alignment will emerge between globalization, information technology and reduced car dependence. The solution will require more visionary and integrated transport planning and financing.

Notes

1 This chapter is based on a synthesis prepared by Brian Williams, UNCHS (Habitat), based on 'Impacts of globalization on urban transportation', a background paper by Peter Newman and Jeff Kenworthy, and 'Transport in the 21st century', a background paper prepared by Paulo Camara, Maunsell Transport Planning, Birmingham, UK.
2 Newman and Kenworthy, 1999.
3 Webber, 1963; 1964; 1968.
4 Hodge et al, 1996.
5 Castells, 1989; Castells and Hall, 1994; Sassen, 1991; 1994.
6 Hall, 1997b, p 89.
7 Willoughby, 1994.
8 Ohmae, 1990; Naisbett, 1994.
9 Winger, 1997.
10 Garreau, 1991.
11 Newman and Kenworthy, 1999 and Kenworthy et al, 1999.
12 Gordon and Richardson, 1989; Gordon et al, 1989; Gordon, Richardson and Jun, 1991; Brotchie, 1992.
13 Analysed by Vuchic, 1999.
14 Hodge et al, 1996.
15 Hussmann, 1995.
16 UNCHS (Habitat), 1996.
17 Local Transport Today, 1999. See Chapters 1 and 2 for more extensive discussion of this point.
18 Ridley, 1995; Allport and Thomson, 1990; Mohan and Tiwari, 2000.
19 See, for example, Feagin, J (1983) 'Rites of way'. In The Urban Real Estate Game. Prentice-Hall, Englewood-Cliffs, chp 6.
20 Stimson, 1995, p 2.
21 Banister, 2000.
22 Medical experts have routinized diagnostic algorithms used by trained personnel when answering hotline calls placed by people who are experiencing symptoms about which they seek to consult a doctor. A veterinarian parallel initiative in the US was called 'First Yelp'.
23 See Mitomo and Jitsuzumi, 1999.
24 For example, in 1999, Allstate Insurance Corporation announced a major restructuring that will eliminate 4000 jobs to save money that it plans to invest in call-in technology. The new system will allow customers to use the internet and the telephone to buy insurance policies, eliminating the need to go through the company's sales agents (*St Louis Post-Dispatch*, Business Section, 11/11/1999). See Chapter 1 for a fuller discussion of how digital technologies work to deepen existing societal inequalities. See Boxes 4.3 and 17.5 for attempts to bridge the digital divide.
25 Godard, 1994.
26 Newman and Kenworthy, 1999.

CHAPTER 12

ENERGY DEMANDS AND CONSUMPTION[1]

As the world moves into the 21st century, energy-related dilemmas are certain to become increasingly intense. Energy challenges have already grown quite severe in cities throughout the world, in countries at all levels of development. From Beijing to Calcutta, from Tehran to Mexico City and from Moscow to Los Angeles, city residents are exposed to unhealthy levels of energy-generated pollution. Urban emissions are also having regional impacts, reducing crop yields and forest integrity in wide areas across North America, Europe and eastern Asia. Furthermore, the greenhouse gas emissions generated in the course of providing power to the world's cities are contributing significantly to the problem of global climate change.

At the same time that the negative environmental impacts of urban energy consumption are manifesting themselves on local, regional and global levels, the demand for energy continues to grow

At the same time that the negative environmental impacts of urban energy consumption are manifesting themselves on local, regional and global levels, the demand for energy continues to grow. This relentless growth in demand for modern energy resources is understandable in cities throughout the developing world, where per capita consumption rates remain startlingly low. Unfortunately, the environmental externalities generated by conventional energy systems are eroding the health and productivity of citizens in many developing country cities, and so new paths towards more efficient and sustainable patterns of energy consumption must be pursued in these areas. However, expanding demand for energy in developed countries, where per capita consumption rates are already very high, is less defensible.

In a context of tightening resource and environmental constraints, persistent global energy inequalities are becoming a source of economic, political and social tension

Indeed, in a context of tightening resource and environmental constraints, persistent global energy inequalities are becoming a source of economic, political and social tension. It is clear that leaders and citizens of the developed world must redouble their efforts to reign in excessive energy consumption, and support the diffusion of new technologies capable of providing power while reducing the environmental damage created by modern patterns of energy consumption.

This chapter explores the dilemmas posed by energy consumption patterns in urban areas throughout the world. It begins by describing the inequalities embedded in the modern world energy system. It then proceeds to examine the human and environmental constraints created by contemporary energy consumption patterns in cities in both developed and developing countries. Following this delineation of fundamental problems, the discussion turns to an analysis of new energy technologies and policy initiatives that may provide options for reducing the severity of urban energy problems. In particular, the fuel cell is highlighted as a system with the flexibility to ameliorate pressing environmental problems in cities throughout the world.

Historical Patterns of Energy Production and Consumption

The world energy system has at least two problematic features that threaten to undermine economic and social progress in cities across the globe. The first involves the system's over-reliance on hydrocarbon resources, and the second involves the inequalities embedded in the system

The world energy system has at least two problematic features that threaten to undermine economic and social progress in cities across the globe. The first involves the system's over-reliance on hydrocarbon resources, and the second involves the inequalities embedded in the system. It has been estimated that about three-quarters of the world's commercial energy is consumed in cities.[2] More specifically, over 75 per cent of carbon emissions from fossil fuel burning and cement manufacturing, and 76 per cent of industrial wood consumption, occur in urban areas.[3] A primary function of the world energy system is to provide urban settlements with massive quantities of electricity, petrol and heat for use in commercial, transport and residential sectors.

As a whole, global reliance on hydrocarbon resources has increased exponentially throughout the modern era. Today, coal, oil and natural gas resources combined provide

approximately 90 per cent of all world commercial energy requirements. The non-hydrocarbon industries of nuclear energy and large-scale hydroelectric power together provide most of the remaining 10 per cent. All alternative energy technologies combined (small hydro, geothermal, wind, solar, tidal) currently provide less than 1 per cent of the world's commercial energy; a sobering statistic for those concerned about the environmental viability of modern society.[4]

Over-reliance on petroleum is a particularly worrisome feature of the energy system, especially where urban centres are concerned. Oil products currently provide around 40 per cent of the world's commercial energy. This share has grown since the mid-1980s, as consumers in the developed and developing worlds have taken advantage of lower petroleum prices offered by OPEC producers. A long-term trend of increasing reliance on imported petroleum, which had been temporarily contained in the 1970s, has therefore reasserted itself.

In recent decades, the nations of the global south have been transferring energy resources to wealthier nations at an increasing rate

It is important to note that the nations of the global south have been transferring energy resources to wealthier nations at an increasing rate in recent decades. By the end of the Second World War the industrialized world was almost totally self-sufficient in energy. Since then, however, regions such as the Middle East and Latin America have exported ever-larger amounts of petroleum to the economies of North America, Western Europe and Japan. These transfers reflect the fact that the Middle East, Central Asia and Venezuela collectively contain over 70 per cent of the world's proven oil reserves. As a result, North American consumers have come to rely on imports for about 10 per cent of their energy supplies, while the import ratio is around 30 per cent for Western Europe and 80 per cent for Japan. Moreover, recent decades have seen significant growth in demand for petroleum resources in countries throughout the developing world.[5]

It would be shortsighted to construct urban infrastructure that is predicated on false assumptions about the availability of cheap and secure oil imports, given these widely acknowledged resource constraints

Overall, cities throughout the world are growing increasingly dependent on petroleum resources imported from a small number of regions. A number of oil-exporting countries have achieved impressive levels of economic growth on the basis of this trade. However, the broader effects of this trend are highly problematic. For instance, cities are exposing themselves to substantial economic vulnerability by turning towards heavier reliance on imported oil supplies. Urban planners need to recognize that the world's production of oil is likely to reach its apex sometime in the next decade or two, and once this occurs petroleum prices will become increasingly volatile.[6] It would be shortsighted to construct urban infrastructure that is predicated on false assumptions about the availability of cheap and secure oil imports, given these widely acknowledged resource constraints.

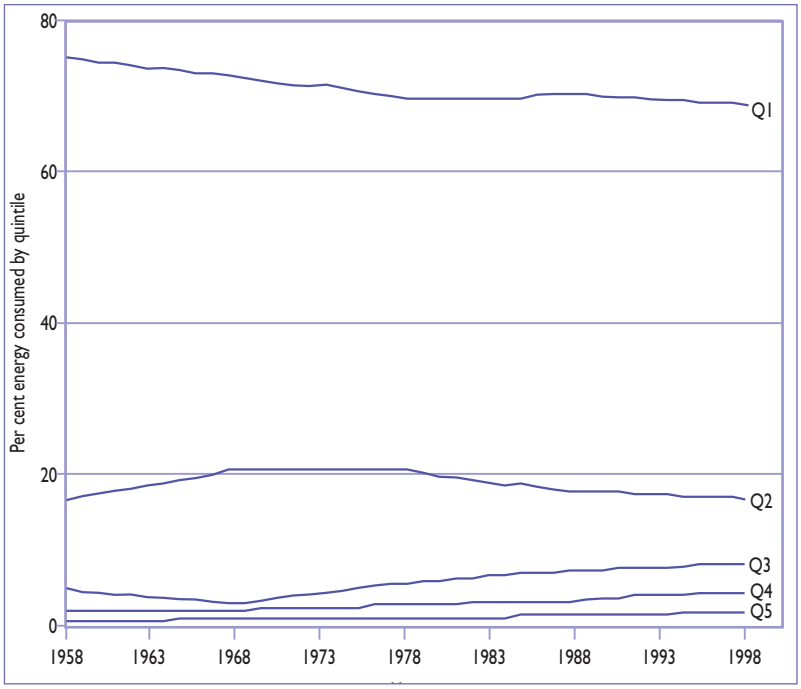


Figure 12.1

World commercial energy consumption by quintiles, 1958–1998[7]

Sources: see Appendix A

In addition to concerns about financial exposure, it is also important to highlight the extremely unequal levels of energy consumption between more developed and developing countries. The average citizen in the United States, for instance, consumes roughly ten times as much energy as a typical person in China and over 20 times more than a resident of India (see Figure 12.3). Even in such major oil-exporting nations as Venezuela and Iran, per capita consumption of commercial energy resources is less than one-third and one-fifth of the US average, respectively. Overall, per capita commercial energy consumption in the United States is more than five times higher than the global average. Meanwhile, it is estimated that around 1600 million people in the developing world have no regular access to commercial energy products at all.[8]

Per capita commercial energy consumption in the United States is more than five times the global average. Meanwhile, around 1600 million people in the developing world have no regular access to commercial energy products at all. The wealthiest 20 per cent of the world's population consumes approximately 68 per cent of the world's commercial energy, whereas the lowest quintile consumes less than 2 per cent

These unequal patterns of consumption show little sign of easing. Their persistence can be demonstrated through an analysis of commercial energy consumption by quintile group.[9] As shown in Figure 12.1, in 1998 the top quintile (containing the wealthiest 20 per cent of the world's population) consumed approximately 68 per cent of the world's commercial energy, while the lowest quintile

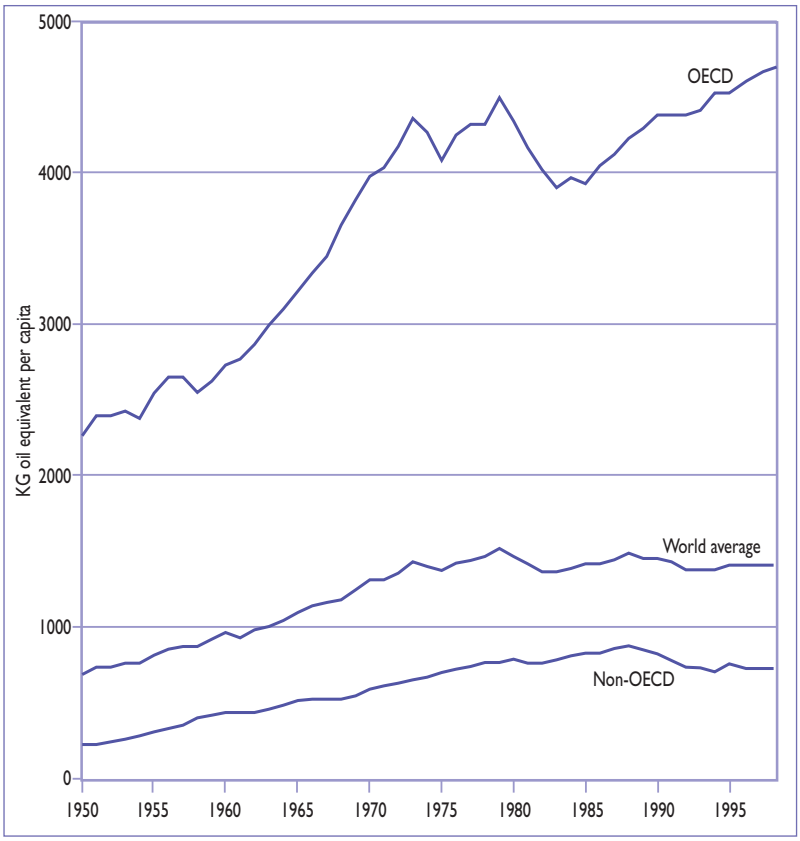


Figure 12.2

Per capita commercial energy consumption, 1950–1995

Sources: see Appendix A

consumed less than 2 per cent of these resources. Figure 12.1, which graphs the quintile distribution over the period 1958–1998, also shows that during the post-1978 period the top quintile has seen its share of world energy consumption remain steady. The second quintile, meanwhile, has seen its share diminish, while the third quintile has increased its share modestly. The bottom two quintiles (containing the poorest 40 per cent of the world's population) have seen virtually no increase in their consumption of the world's commercial energy resources. In sum, though there has been a slight change in the relative share of the world's commercial energy resources going to the second and third quintiles, inequalities have remained fundamentally unaltered in the post-1958 period.[10]

Global energy inequalities have remained fundamentally unaltered since 1958

While many people in the developing world struggle to gain access to modern energy technologies, citizens and companies in the global north are generally consuming energy resources at an unsustainable rate. The high levels of energy use found in wealthy countries are the source of most of the greenhouse gases emitted into the atmosphere today.[11] In contrast, most citizens in the global south, because of poverty, produce relatively little energy-related greenhouse emissions. Compare the very different rates of greenhouse gas emissions found in particular countries. The energy used annually by an average US resident generates over 20 times as much carbon dioxide as a typical Indian, over seven times as much as a typical Chinese and over five times as much as the global average. Since these gases remain in the atmosphere for long periods of time, it should also be noted that nations of the developed north have emitted most of the total greenhouse gases accumulated in the atmosphere over the last two centuries.

At the same time as the environmental problems of conventional patterns of energy consumption are becoming manifest, there is growing need for modern forms of energy in the developing world. To put the challenge in perspective, consider that during the period 1970–1990 approximately 40 million people per year gained access to modern energy services. Given the number of people currently in need of service, combined with expected population growth, almost 100 million people would have to be connected to modern energy systems each year in order to achieve universal access by around 2020.[12] This is certainly a daunting task, especially given tightening resource and environmental constraints.

Many of the people in direst need of access to modern energy systems are located in rapidly growing urban settlements throughout the developing world. With diminishing traditional sources of fuel, the citizens of medium and large cities often face escalating energy prices while they are forced to contend with the pollution generated by conventional energy industries. Residents of cities in the developed world, meanwhile, are increasingly experiencing problems associated with overconsumption of energy resources. The next section of this report explores these energy dilemmas in cities across the globe in more detail.

Development Constraints Created by Urban Energy Consumption Patterns

Historically, cities throughout the world have been arenas of tremendous economic and social development. The higher densities of people and material resources found in urban areas allow significant gains in productivity to be achieved, while reducing human impacts on natural ecosystems. These higher densities also make it easier to provide basic services to citizens, and as a result urban areas also have the potential to offer better health, education, sanitation and electrical services than are found in most rural areas.[13] From both a human development and environmental point of view, therefore, it makes eminent sense to encourage the continued growth of high-density population centres – provided underlying developmental problems can be addressed.

Many of the most severe challenges confronting cities originate from the manner in which energy resources are produced and consumed. While energy is a key input for urban development, virtually every type of power generates varying levels of environmental problems. Some of these impacts are experienced outside city limits. The harvesting of wood for use by impoverished city residents in Asia and Africa, for instance, has led to extensive deforestation around numerous urban areas.[14] The mining of coal and uranium, and the construction of large-scale hydroelectric dams – activities required for the provision of the bulk of

the electrical power consumed in cities – have also led to widespread disruption of ecosystems and rural communities throughout many regions of the world.[15] Within cities, meanwhile, intensive levels of energy consumption are leading to unprecedented, spatially concentrated forms of pollution.

More than 1000 million people throughout the world live in urban settlements where air pollution levels exceed health standards. The health costs of urban air pollution approach US$100,000 million annually

It has been estimated that more than 1000 million people throughout the world live in urban settlements where air pollution levels exceed health standards. The human consequences of this energy-generated pollution can be quite significant. In the United States, for instance, it is thought that at least 28 per cent of the urban population is exposed to harmful levels of particulates; a level of exposure that causes the premature death of an estimated 40,000 US residents each year. Meanwhile, 46 per cent of the US urban population is exposed to unhealthy levels of ozone, which exacerbates respiratory and cardiovascular diseases in a growing portion of the population. In European cities conditions are equally bad, with high levels of energy-related pollution causing elevated cases of chronic pulmonary disease and mortality. In the developing world, conditions are even more extreme. In Mexico City, high levels of pollution are estimated to cause over 6500 deaths each year. Meanwhile, over 52,000 people in 36 Indian cities are thought to have been killed by air pollution in 1995 alone. And in China, air pollution is estimated to cause anywhere from 170,000 to 280,000 deaths each year. On top of the human toll registered in these figures, there are growing financial costs as well. In developed countries, air pollution is estimated to cost around 2 per cent of GDP; in developing nations such pollution can cost anywhere from 5 to 20 per cent of GDP. On a global scale, the health costs of urban air pollution are thought to approach US$100,000 million annually.[16]

Severe manifestations of energy-related urban problems in the developing world have the potential to overshadow the fact that it is cities in the industrialized world that contribute the most to global environmental problems

Severe manifestations of energy-related urban problems in the developing world have the potential to overshadow the fact that it is cities in the industrialized world that contribute the most to global environmental problems. Before examining the challenges faced by urban residents in developing nations, therefore, it is worthwhile to highlight the damage being wrought by overconsumption in wealthy nations.

Cities in the United States have particularly high levels of energy consumption and its attendant pollution problems. In a study of 47 metropolitan areas across the world, US cities emerged as being by far the most energy-intensive.[17] The sprawling, low-density cities that have proliferated in the United States in the post-Second World War era have been predicated on the extensive use of private automobiles, which is the least efficient form of transport available. This structural foundation has made it difficult to develop viable public transit systems, and many suburbs are also poorly served by pavements and bike lanes. Over-reliance on private cars has translated into problems of traffic congestion and ambient pollution. Moreover, the vast car parks and road systems required by this mode of transport have contributed significantly to the urban heat island effect, which causes city residents to use air conditioners more frequently and further increases the consumption of energy. Citizens of lower classes in these cities are often underserved by systems that depend on private cars, while they are typically exposed to the brunt of the pollution effects that are generated.[18] Given these multiple consequences, this model of urbanization is undermining the quality of life and economic efficiency of cities such as Atlanta, Denver, Los Angeles, the San Francisco Bay Area, Seattle and Washington, DC.[19]

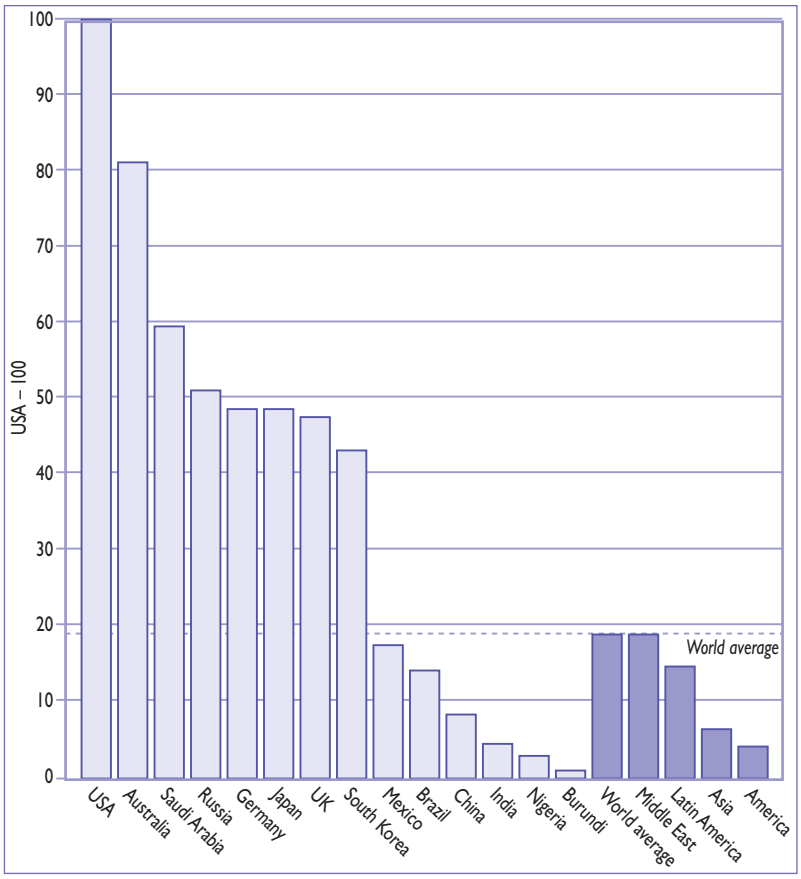


Figure 12.3

Per capita commercial energy consumption relative to US, 1998

Cities in the United States have particularly high levels of energy consumption and its attendant pollution problems. Though the problems inherent in low-density, automobile-reliant cities are increasingly in evidence, this model of urbanization is being replicated in many other developed countries

Though the problems inherent in low-density, automobile-reliant cities are increasingly in evidence, this model of urbanization is being replicated in many other developed

countries. Numerous cities in Canada, for instance, are exhibiting patterns of urban sprawl that have long been the hallmark of US cities. Again, this form of urban organization translates into high levels of energy consumption and pollution. Indeed, it has been estimated that almost 40 per cent of total anthropogenic carbon dioxide emissions from North America comes from 50 metropolitan areas.[20] Many Australian cities are also evolving in this pollution-intensive direction.[21]

While the infrastructural characteristics of cities in the developed world heavily condition the energy consumption options of residents, it is also clear that affluent populations in these metropolitan areas are often encouraged by private corporations to make choices that exacerbate such problems. In a context of low energy prices during the mid-1990s, for instance, large numbers of North American consumers were to purchase extremely inefficient sports utility vehicles and energy-intensive homes. This behaviour is beginning to be mimicked in parts of Western Europe.

In recent years, energy efficiency gains have slowed or even been reversed in numerous developed nations

The result has been that energy efficiency gains have slowed or even been reversed in some transport and residential sectors in numerous developed nations in recent years.[22]

The primary responsibility for reducing impacts of energy-related environmental problems should rest on those living in the wealthiest regions of the world economy

As a result of these dynamics, the largest per capita contributors to energy-related environmental problems continue to be affluent citizens living in cities throughout the developed world. The primary responsibility for reducing such impacts therefore should rest on those living in the wealthiest regions of the world economy. Still, there are also serious energy-related problems emerging in cities in the developing world. The following brief analysis of dilemmas emerging in metropolitan centres in poorer regions will make clear that significant developmental constraints are being generated by conventional energy systems there as well.

While cities in the developed world confront problems originating primarily from overconsumption, metropolitan areas in the developing world face a much more complex set of energy dilemmas. On the one hand, the vast majority of urban residents in cities throughout the Southern hemisphere suffer from inadequate access to modern energy systems. On the other hand, even at low per capita levels of consumption many of these cities are generating very intense forms of pollution. There are a number of factors that are producing this unfortunate combination of low per capita consumption rates and high aggregate urban emissions throughout the developing world.

First, there is the issue of population increase. The rapid growth of cities in Latin America, Africa and Asia has generated such high densities of people that even modest levels of energy consumption at the individual level can translate into severe environmental problems. Unlike in large cities in the Northern hemisphere, local municipal agencies in the Southern hemisphere are rarely able to mobilize sufficient resources to cope with these growth-related challenges. In fact, budgetary pressures have forced many cities throughout the developing world to reduce environmental expenditures in general, and energy management in particular, even as the scale of the problems continues to expand.[23]

The fact that certain large cities in the Northern hemisphere have had some success in confronting energy-related challenges indicates that population pressures can be managed

The fact that certain large cities in the Northern hemisphere have had some success in confronting energy-related challenges indicates that population pressures can be managed. High population densities in the Southern hemisphere, while certainly posing a significant challenge, are clearly not the sole factor leading to problematic outcomes.

While privileged classes in the South often replicate the modern, energy-intensive lifestyles found in North America, numerous impoverished urban inhabitants depend on heavily polluting resources such as wood and coal. Public policy often exacerbates these inequalities

Of at least equal importance as population pressures are the severe social inequalities found in cities throughout the developing world. While privileged classes in the Southern hemisphere often replicate the modern, energy-intensive lifestyles found in North America, substantial numbers of impoverished urban inhabitants are forced to subsist on heavily polluting resources such as wood and coal.[24] Public policy often exacerbates these inequalities. For instance, the limited subsidies for energy products provided in many developing countries have been shown to benefit wealthier residential or industrial groups, while the truly impoverished typically pay high unit costs for resources purchased in informal markets.[25] In short, affluent urban consumers generally contribute disproportionately to pollution problems while poorer residents are again subjected to higher levels of exposure to energy-generated pollution throughout the developing world.

A final factor that contributes to energy-related difficulties in less affluent cities has to do with technological inadequacies found in their energy sectors. Electrical power plants currently in operation in the developing world, for instance, are estimated to be between 20 and 40 per cent less efficient than plants typically found in industrial countries. Transmission losses, meanwhile, are thought to lead to losses of another 20 per cent. This means that more than half the energy that is normally put to use in developed countries is often lost in the developing world, though

the environmental externalities are still being generated.[26] In the case of transport sectors, huge efficiency losses are again incurred because of old vehicles and congested roads. More seriously, the continuing use of leaded petrol in many developing country cities is causing neurological, cardiac and other health problems in urban residents.[27]

Technological upgrading is sorely needed in energy sectors throughout the Southern hemisphere. The dilemma is how this can be achieved. Some analysts believe that the development process itself will inherently address these issues. For instance, it has recently been suggested that a bell-shaped, Kuznets-type curve describes the relationship between local pollution and levels of economic development.[28] At very low levels of development, poverty appears to limit the ability to pollute and so emissions rates tend to be low. As industrialization and urbanization begin to accelerate, however, larger quantities of resources are often consumed in relatively archaic, unregulated conditions and air quality tends to worsen. It is generally thought that only once a city or country has reached higher levels of affluence, and social demands for better qualities of life have been articulated, that resources will be mobilized to improve technological systems and counteract the impact of pollution.

While the potential existence of this Kuznets curve has led some to assume that development automatically cures underlying environmental problems, the fact that the majority of the world's urban residents are located at the beginning of the curve has troubling implications. Unless concerted efforts are made to bypass the curve, through proactive policies of technology transfer and careful regulation, the human and environmental damage generated by urban energy consumption will escalate dramatically.

The combined effects of energy overconsumption in affluent cities and inadequate energy sectors in developing cities, are clearly producing serious pollution problems on local and regional levels. Though the causal connections are less obvious, it is also known that urban settlements are contributing significantly to the problem of global warming. Cities themselves are thought to be particularly vulnerable to the consequences of climate change. It is expected that infectious diseases will proliferate in a warmer world, especially in dense urban settlements. Regional temperature rises will foster more urban smog. Changes in precipitation will adversely affect urban water supplies. An increase in extreme weather events will cause damage to urban infrastructure, and a rise in sea levels will begin to threaten coastal cities throughout the world.[29]

Given the likely consequences of climate change, urban managers throughout the world are facing a closing window of opportunity in which to undertake proactive strategies of damage control. As the financial costs of global warming begin to mount,[30] fewer and fewer cities will have the resources to foster the diffusion of new energy technologies that could reduce environmental impacts. The time for concerted action is clearly upon us. But are there alternative energy technologies that could provide solutions to the energy-related developmental constraints that are emerging in both affluent and impoverished cities? A growing body of evidence suggests that the answer to this question is a tentative yes. The following section examines the energy technologies that may have the capacity to ease these constraints in urban settlements throughout the world.

Sustainable Energy Technologies Appropriate for Urban Applications

Advances in a variety of new energy technologies offer considerable promise for reducing pollution, increasing efficiencies and broadening the resource base of urban energy sectors in countries at all levels of development. The new energy systems that hold the most promise for enhancing sustainability include small-scale hydroelectric, wind, solar, modern biomass and fuel cell technologies. While the literature on these new energy systems has generally highlighted the potential for their utilization in rural areas, it is becoming clear that they can make a significant contribution in urban energy sectors as well.

A few of these new energy technologies are locationally restricted, but they could provide power to urban areas via long-distance transmission. Small-scale hydroelectric stations, for instance, offer one of the most benign forms of energy production available to the world. In contrast to disruptive large-scale hydroelectric projects, small-scale systems allow electrical power to be generated without significantly altering the flow of rivers. Wind systems offer similarly benign options for electrical generation in areas surrounding cities. And large-scale solar arrays have been shown to be capable of generating electricity that can then be fed into utility grids.[31]

With the support of development agencies, governments and corporations, more environmentally sustainable energy systems can begin to bring electricity to urban communities throughout the world

If development agencies, governments and corporations begin supporting such alternative energy systems, a more environmentally sustainable network of facilities can begin to bring electricity to urban communities throughout the world in the coming decades.

Urban areas have long benefited from preferential energy provision. Inadequate access to modern energy services in rural areas is one factor prompting migration to cities in many regions of the world. It is therefore important for policy makers to ensure that the benefits of new energy technologies are equitably shared by rural and urban settlements

Urban areas have long benefited from preferential treatment in terms of energy provision. Indeed, inadequate

access to modern energy services in rural areas is one factor prompting migration to cities in many regions of the world. It is therefore important for policy makers to ensure that the benefits of new energy technologies are equitably shared by rural and urban settlements alike. Moreover, it is crucial that cities begin reducing their burdens on rural areas by generating their own power. Urban-based solar, biomass and fuel cell technologies offer opportunities to improve the self-reliance of urban energy sectors.

Solar thermal and photo-voltaic systems designed for use in metropolitan areas have received increasing attention in the last decade. In part this continued growth is the result of public support. In the US, for instance, the Million Solar Roofs Programme has helped to foster the diffusion of solar thermal and photo-voltaic systems in numerous cities.[32] In Japan, the New Earth 21 programme has aggressively promoted solar system construction in urban areas.[33] In Western Europe, publicly funded programmes have supported the proliferation of photo-voltaic roofs and building facades.[34] Smaller government programmes in South Korea, Mexico, Brazil, India and China have fostered solar systems for domestic use and export as well.[35]

Recent trends show fast-growing private investment in solar systems by sophisticated companies with access to the capital required to fully commercialize needed technologies

Of crucial importance, meanwhile, has been recent growth in private investments in solar systems. Indeed, major multinational energy corporations are increasing their participation in solar power sectors.[36] While there are still many small manufacturing companies in solar sectors, the trend is towards greater involvement by sophisticated, high-technology companies with access to the capital required to fully commercialize solar technologies. All of these initiatives are increasing the usable electricity and heat generated by built structures in cities throughout the world.

Another strategy for expanding city-based energy production involves the utilization of modern biomass technologies to turn waste materials into sources of useful power. The huge volumes of solid and liquid waste generated by metropolitan areas throughout the world are replete with combustible resources. Urban waste contains large amounts of organic material, while landfills and sewage tailings spontaneously generate methane gas: a powerful greenhouse gas. These solid and gaseous materials can be fed into a variety of incineration systems, thereby simultaneously reducing the volume of wastes while generating heat and electricity from inexpensive, plentiful urban resources. Given this combination of advantages, waste-to-energy projects have proliferated throughout North America, Western Europe and Japan.[37] Similar projects are underway in developing countries such as Brazil, Chile, South Africa, Hong Kong, Indonesia and China.[38]

Greater use of urban-based solar and biomass technologies provides options to increase the efficiency and reliability of local electrical grids that supply power to residential and commercial locations. But these systems cannot directly serve the energy-intensive transport sector, which generates a great deal of pollution. The fuel cell, however, can be used to power automobiles, as well as residential, commercial and energy-to-waste systems. Given its remarkable flexibility, the fuel cell is emerging as a new energy technology with tremendous potential applications in urban settings.

Fuel cells resemble common batteries, in that they rely on chemical reactions to produce electricity. In their most environmentally pristine form, fuel cells are injected with hydrogen and oxygen which, when exposed to a catalyst, react to generate electricity. In hydrogen-powered fuel cells, pure water is the only by-product generated by this electrochemical reaction. Recent engineering innovations have also permitted the use of fuels such as methanol, methane and petroleum in fuel cell systems; these fuel cells do generate some carbon dioxide emissions. But because fuel cells can attain much higher efficiency rates than conventional engines, their emissions levels are greatly reduced even when they are powered with gases derived from fossil fuels.[39]

Fuel cells can be assembled in stacks of different sizes, from systems small enough for use in electronic devices to systems large enough to generate electricity in grid-connected power stations. Numerous companies have already begun manufacturing fuel cells for use in laptop computers, roadside warning signs and other small electronic components.[40] Meanwhile, firms such as Analytic Power and Plug Power are developing medium-sized fuel cell systems for use in residential homes.[41] And corporations such as General Electric, Mitsubishi, Tokyo Electric Power, Toshiba, United Technologies and Westinghouse have begun manufacturing large fuel cells designed to generate electricity for commercial buildings and utility grids.[42] The competitive race to bring fuel cell-powered products to the consumer market has become particularly intense in the automotive industry. The current leader in the effort to mass-produce fuel cell vehicles is a partnership between the Ballard Power, DaimlerChrysler and Ford corporations. Meanwhile, General Motors and Toyota have teamed up to develop their own fuel cell cars. Similar efforts are being undertaken by Honda, BMW and Mitsubishi Motors.[43]

The first generation of commercial fuel cells will be powered primarily by methanol and natural gas mixtures. Although still generating some pollution, these fuel cells will significantly increase the efficiency with which conventional hydrocarbon resources are consumed. Petroleum corporations such as ARCO, British Petroleum, Nippon Oil, Royal Dutch Shell and Texaco have already begun developing refining and distribution systems to provide methanol, natural gas and hydrogen to consumers using fuel cell systems.[44]

It is possible to operate fuel cells on methane gas collected from sewage systems and municipal landfills, thereby reducing the emission of an extremely harmful greenhouse gas while providing a useful source of energy

It is also possible to operate fuel cells on methane gas collected from sewage systems and municipal landfills, thereby reducing the emission of an extremely harmful greenhouse gas while providing a useful source of energy.[45]

The widespread use of fuel cell systems is certain to occur first in affluent cities. Indeed, the first large deployment of fuel cell vehicles is scheduled to occur during the period 2000–2005 in California metropolitan areas. Cities in Japan and Western Europe, meanwhile, are aggressively pursuing commercialization as well. But the diffusion of fuel cells need not be restricted solely to cities in the developed world. Indeed, studies currently underway in cities such as São Paulo, Delhi, Hong Kong and Beijing suggest that fuel cell-powered buses, motor scooters and stationary power generators could help to ease environmental problems in cities in developing countries as well.[46]

A variety of new energy technologies have clearly attained the engineering maturity required for use in many different urban settings. Researchers at the World Bank, the World Energy Council, the International Energy Agency and the US Department of Energy have also gathered evidence indicating that numerous alternative energy systems are approaching the price competitiveness required for large-scale commercialization.[47] As shown in Figure 12.4 and Table 12.1, comparative cost information gathered on different kinds of electrical generation systems reveal a closing price gap between conventional and new energy systems. It should be noted that, for a variety of reasons, these data on electrical generation costs must be treated with caution. To begin with, these cost estimates are averages from many regions of the world and they are based on facilities with widely varying technologies and operating histories. Second, it is difficult to account for the effects of subsidies on generation costs. Since it has been well documented that conventional power sectors receive extensive subsidies throughout the world, it is likely that the generation costs shown for these sectors underestimate true costs. Similarly, it is hard to factor in externality costs for conventional energy systems, again resulting in an underestimation of true conventional energy costs. Even given these price distortions, however, it is clear that wind, biomass, solar and fuel cell systems are approaching commercial viability in many markets throughout the developed and developing worlds.

Given relatively moderate levels of public support, alternative energy systems could be providing 20 per cent of the world's energy by the year 2100

The world commercial environment appears set at last to foster the expansion of new energy systems. Although it is impossible to predict how quickly new energy technologies can spread, it nevertheless appears that they are in a strong position to begin processes of rapid diffusion in the coming decades. Indeed, in a recent analysis published by the World Bank[48] it was argued that, given relatively moderate levels of public support, alternative energy systems could be providing 20 per cent of the world's energy by the year 2100.

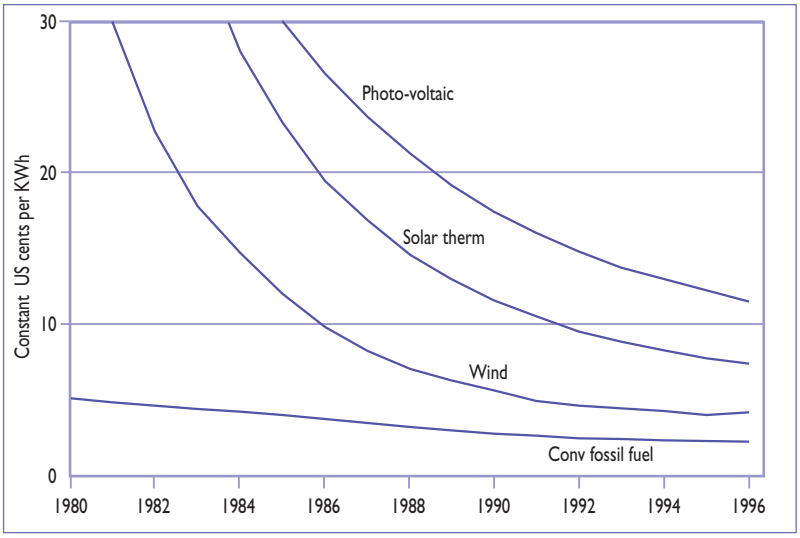


Figure 12.4

Average US electricity generation costs

Sources: Weinberg, 1994; US EIA, 1997c

The final section of this discussion turns to an analysis of strategies that could accelerate this diffusion of new energy systems in urban areas throughout the world. When combined with efforts to more effectively organize energy sectors in cities at all levels of development, these new technologies may provide opportunities to ease the constraints that are increasingly hindering economic and human advancement in many metropolitan areas.

Strategies for Achieving Reform in Urban Energy Sectors

As the world enters the 21st century, the long-term viability of urban energy sectors throughout the world is increasingly being called into question. If new generations of city residents are to be provided with access to vital energy systems, and urban environments are to be simultaneously improved, at least three underlying developmental challenges must be addressed. First, existing urban energy systems must be reorganized in order to enhance efficiencies. Second, new energy technologies, which minimize urban pollution, must be made widely available to cities throughout the world. And third, the inequalities embedded in the world energy system must be reduced.

Before examining the prospects for achieving these objectives, it is necessary to highlight the institutional context within which attempts at urban reform are most likely to succeed. Extensive experience has revealed that

Table 12.1

Estimated global average costs of grid-connected electricity, circa 1995

Technology	1990 US cents per kWh
Average electrical costs in urban areas	8.0–10.0
Coal-powered utilities	2.5–4.0
Natural gas-powered utilities	2.5–5.0
Wind-powered systems	4.5–8.0
Modern biomass systems	7.0–12.0
Solar-thermal systems	8.0–20.0
Fuel cell systems	9.0–15.0
Photo-voltaic systems	20.0–70.0

Sources: See endnote 20.

lasting changes in local city environments are most reliably achieved through the combined efforts of grassroots groups, government officials and private enterprises. National and multilateral development agencies certainly have an important role to play in fostering sustainability, but these agencies have to work closely with local groups if reforms are to be actually carried out.[49]

It is only when local civic organizations and business interests participate in designing and implementing reform agendas that efforts to achieve sustainability have a reasonable chance of success.

It is only when local civic organizations and business interests participate in designing and implementing reform agendas that efforts to achieve sustainability have a reasonable chance of success

Fortunately, it would appear that policy reformers are taking these lessons to heart. Indeed, in the field of urban management there has been a proliferation of programmes intended to foster public–private coalitions and enhance cooperation between local, national and international organizations. Given innovative efforts such as the International Council on Local Environmental Initiatives[50] (ICLEI) Cities for Climate Protection Campaign, the Clean Cities Programme and the Local Agenda 21, among others, it appears that the institutional environment is at last favouring participatory approaches to reform. The achievements of some of these coalitions will be highlighted as we turn to a review of contemporary initiatives that are underway to improve urban energy sectors.

Low-cost strategies have resulted in improved transport efficiencies and lower rates of urban pollution in Curitiba

Although this discussion has emphasized the key role that new energy technologies can play in improving urban sustainability, energy efficiencies can also be enhanced at the city level by reorganizing urban services and directing growth in specific directions. Perhaps the best example of this strategy can be found in the city of Curitiba, Brazil. Urban planners, working in close consultation with local residents and businesses, began by designating a number of transport corridors that ran along the axes of the city as open only to authorized buses. These corridors substantially improved the efficiency and reliability of public transport, resulting in a very high level of usage. Furthermore, this coordinated planning allowed real estate developers to build new properties in specified locations, with the confidence that the public would have easy access to their commercial and residential areas on the transit lines. These low-cost strategies have resulted in improved transport efficiencies and lower rates of urban pollution in Curitiba.[51] Many other cities, including Copenhagen, Portland, Singapore, Surabaya, Toronto and Zurich, have pursued similar strategies of reorganizing existing urban areas in order to improve transport efficiencies.[52]

It is also possible to upgrade energy systems, thereby achieving higher efficiencies and lower environmental impacts. For instance, emissions from urban transport sectors can often be reduced by shifting to alternative fuels such as compressed natural gas, liquefied petroleum gas and ethanol.[53] This is precisely the strategy that will be pursued in Hong Kong, where extremely high levels of ground-level pollution prompted taxi and truck drivers to organize a protest in which they demanded that city officials accelerate conversion to liquefied petroleum gas.[54] In another example of system upgrading, existing electrical power plants can often be transformed into cogeneration systems that make more effective use of the large amounts of heat generated in the process of producing electricity.[55]

The virtue of these strategies of system upgrading is that they can often be carried out by local municipalities, at quite moderate cost. Consider, for instance, the achievements of the ICLEI. The ICLEI consists of over 300 cities in all regions of the world that are committed to reducing their carbon dioxide emissions. At the 1997 Kyoto Climate Change Summit, the ICLEI reported that these cities had together succeeded in reducing carbon emissions by more than 41 million tons. Moreover, it was shown that in nearly every case these reductions were associated with an improvement in the local economy.[56] Many other urban coalitions, including the US Clean Cities Programme and the European Energie-Cités project, are having similar success in improving efficiencies and reducing energy-related pollution at little or no cost.[57]

In addition to upgrading existing energy systems, it will also be necessary to accelerate the diffusion of new energy technologies to urban areas throughout the world. As discussed in the previous section, a variety of innovative energy systems have reached the engineering maturity required for successful utilization in metropolitan regions. The challenge now is to foster commercial expansion in new energy sectors.

Opening utility grids to small-scale electricity producers would reduce one institutional barrier that has inhibited the expansion of alternative energy sectors

To accomplish this, fair market conditions must first be introduced into energy industries. Currently, decentralized energy providers are generally prevented from connecting to power grids. Opening utility grids to small-scale electricity producers would reduce one institutional barrier that has inhibited the expansion of alternative energy sectors in many countries.

More importantly, the massive subsidies provided to conventional fossil fuel and nuclear power sectors must be substantially reduced.[58] While removing subsidies is often politically difficult, it is important to note that these subsidies tend to benefit large industrial producers and consumers rather than the truly impoverished.[59] Once the commercial playing field is levelled in these ways, private-sector dynamics can begin to foster the expansion of new energy systems in cities throughout the world.

Massive subsidies for conventional fossil fuel and nuclear power must be substantially reduced. These subsidies tend to benefit large industrial producers and consumers rather than the truly impoverished

There are other, market-based mechanisms that are likely to provide additional support to environmentally friendly energy systems. For instance, emissions trading schemes are already encouraging private companies to invest in domestic acid rain-reduction technologies in North America.[60] Similar agreements show promise on the international level. The Prototype Carbon Fund, an emissions trading system administered by the World Bank that focuses on renewable energy systems, attracted more private investments in its first six months of operation than had been expected for its entire first year of operations.[61] The Joint Implementation and Clean Development Mechanisms, meanwhile, should facilitate the international transfer of new energy systems; under the provisions of these agreements companies headquartered in developed countries will be able to get credit for emissions reductions they achieve by investing in new energy ventures in developing countries.[62]

While these market-based strategies are certain to be important components of any global effort to accelerate the diffusion of new energy technologies, by themselves they are not likely to represent a sufficiently robust policy response. In part this is because emissions trading mechanisms may allow cities that are currently over consuming resources to purchase relatively inexpensive permits and thereby continue such behaviour.[63] What is needed as well is an influx of public and private investments that can finance the construction of new energy infrastructures. Unfortunately, at present, the level of funding for new energy projects does not appear to be adequate to the task.

Since the economic crisis of 1997–1999, governments throughout the world have sharply scaled back public funding for energy infrastructure development.[64] In place of public financing, it has been hoped that energy sector restructuring would prompt private companies to increase their investments in energy projects. While a few countries in Latin America have seen modest growth in private investments, the vast majority of cities throughout the world have been forced to contend with declining public and private energy sector investments.[65]

Given this difficult context, an increasing number of countries have turned to multilateral development agencies such as the World Bank Group for assistance in upgrading existing energy sectors and expanding new energy systems. However, while the World Bank has publicly acknowledged the need to increase financing for new energy projects,[66] reforming its own investment practices has proved to be difficult. For instance, during the period 1995–1999 the World Bank Group's total portfolio of lending commitments to energy projects amounted to US$13,500 million. Just over US$1000 million of this financing, or about 7 per cent of the total, went to renewable energy projects. In comparison, over US$3600 million, or 27 per cent of the total, went directly to oil, gas and coal projects. The remainder went to large-scale hydroelectric and utility grid development. Though the World Bank has made great strides in publicizing the potential benefits of new energy technologies, its lending portfolio clearly still favours conventional, environmentally problematic energy technologies. Moreover, during the period 1995–1999 annual World Bank lending for energy projects has actually declined, even as its own studies highlight the need for greater commitments to improving energy systems across the world.[67]

While a contraction in energy-related investments by national governments, private companies and multilateral development agencies has been occurring in recent years, it is expected that this trend will eventually reverse itself and a new round of financing will become available for energy development projects. Once this occurs, it is likely that a substantial portion of these new resources will be utilized to expand sustainable energy systems. A variety of international mechanisms, such as the Global Environment Facility and the Clean Development Mechanism, are now available to utilize capital resources more effectively.[68] National governments, under moderate pressure from the Kyoto Accords, are also committing themselves to pursuing emissions-reduction strategies that favour new energy technologies.

And city-level coalitions such as the ICLEI and Local Agenda 21 have proved to be capable of spearheading innovative energy reforms in many metropolitan regions. In short, the policy environment appears to be at last set to favour true changes in urban energy industries in urban centres throughout the world.

City-level coalitions such as the ICLEI and Local Agenda 21 have proved to be capable of spearheading innovative energy reforms in many metropolitan regions

There still remains, of course, uncertainty regarding how to reform the severe inequalities in energy consumption that are embedded in the contemporary world energy system. As shown earlier, high-income nations consume a disproportionate share of the energy resources available for human use. These consumption practices cannot be universalized without causing rapid environmental crises at regional and global levels.

Instead of supporting the replication of these unsustainable consumption practices in the less developed economies, international policy priorities should focus on reducing energy consumption rates in affluent nations. Unfortunately, there is little indication that the political will exists to begin addressing this most intractable development constraint.

Instead of supporting replication of unsustainable consumption practices in the less developed economies, international policy priorities should focus on reducing energy consumption rates in affluent nations

It is possible that a grim future lies in store for urban settlements throughout the world. The impacts of global warming, which are already beginning to become manifest, are likely to hit metropolitan regions particularly hard. The window of opportunity to take proactive steps to reduce local and global environmental threats will narrow, as the effects of climate change begin to take their toll on municipalities in affluent and impoverished nations. What is needed in the current era is the creation of a coalition – involving grassroots organizations, national governments and multilateral organizations – which has as its central goal the reduction of overconsumption in developed nations. The work of the United Nations Development Programme, which has attempted to document and counteract growing inequalities in the world economy, may provide a model upon which to build in this regard.[69] For in the field of energy policy, as in most other spheres of development, it will only be by fundamentally redefining the agenda of development – to focus on reducing overconsumption – that true sustainability has a chance to be attained.

Appendix A: Energy Data Sources and Conversion Procedures

The quantitative data on energy production and consumption presented in this report come from the following sources: (1) for the period 1950–1995: United Nations (1997); and (2) for the 1996–1998 period: US Energy Information Administration (1999). Since particular energy resources have different quantities of useful energy per volume unit, it is necessary to convert each distinct resource into comparable units before data aggregation or comparison is undertaken. For this report, volume units of measurement have been converted into *oil equivalencies* using conversion factors published in the United Nations (1997) source.

Appendix B: Methods Used to Calculate Energy Consumption Quintiles

To calculate energy consumption quintiles, countries were first ranked according to their per capita energy consumption in each individual year. Once ranked in this way, countries were then grouped into 20 per cent portions of the world's population. In cases where countries fell across the 20 per cent dividing line, they were divided proportionately between the respective quintile groups (ie the same proportion of the country's population and energy consumption were placed into the appropriate quintiles). Given these calculations, it was then possible to determine what proportion of the world's commercial energy was consumed by each quintile in each given year.

Notes

1 This chapter is drawn from 'Urban energy dilemmas in a globalizing world: Implications for economic growth, social justice and environmental sustainability', a background paper prepared by Bruce Podobnik, Lewis and Clark College.

2 This estimate, which comes from the OECD, 1995, p 20 should be seen as a very rough approximation of urban energy consumption. Few efforts have been undertaken to gather city-level energy consumption information, though the data collection project currently being carried out under the auspices of the United Nations Urban Indicators Programme (UNCHS, 2000) should begin to remedy these gaps in empirical information.

3 O'Meara, 1999, p 7.

4 See Appendix A for a full description of the sources of the quantitative data presented in this report.

5 Import ratios come from the energy data described in Appendix A. For similar figures, see Bairoch, 1993, p 59; the World Energy Council, 1995; International Energy Agency, 1996. For an analysis of rising demand for petroleum in developing countries, see Gately and Streifel, 1997.

6 For analyses of global petroleum reserves and estimates on when world production will peak, see WEC, 1995, p 13; IEA, 1996, p 31; US EIA, 1997a, Table 11.3; MacKenzie, 1997, pp 25–27; Campbell and Laherrere, 1998.

7 To calculate energy consumption quintiles, countries were first ranked according to their per capita energy consumption in each individual year. Once ranked in this way, countries were grouped into 20 per cent portions of the world's population. Given these calculations, it was then possible to determine what proportion of the world's commercial energy was consumed by each quintile (20 per cent portion of world's population) in each given year. So, for instance, in 1998 the top quintile consumed around 68 per cent of the world's commercial energy.

8 World Energy Council, 2000.

9 See Appendix B for a description of the methods used in calculating energy consumption quintiles.

10 It should be noted that within-nation inequalities are often severe as well. For studies documenting inequalities within nations, see Barnes, 1995; Parikh et al, 1997.

11 See the data sets made available by the Carbon Dioxide Information Analysis Center (CDIAC, 2000) for further information on greenhouse gases. Its web site is http://cdiac.esd.ornl.gov/home.html.

12 WEC, 2000.

13 However, see the discussion of water supply and sanitation provision elsewhere in this report for a critical examination of rural–urban comparisons.

14 WRI, 1996, p 63.

15 McCully, 1996; O'Meara, 1999.

16 For the United States, see US EPA, 1997; for Europe, see EEA, 1996; for Mexico, see Eskeland, 1992; for India, see Kumar, et al, 1997; for China, see Florig, 1997; for the economic estimates, see Leitmann, 1999, pp 15–16.

17 See Kenworthy and Laube, 1999, and Newman and Kenworthy, 1999, for detailed information on this international study of urban areas.

18 Harvey, 1996.

19 See Firestone, 1999 and Stoel, 1999, for analyses of US transport problems attendant with processes of suburbanization.

20 Gatlin, 1995.

21 Kenworthy and Laube, 1999.

22 IEA, 1998; Bradsher, 1999.

23 Sheng, 1997.

24 For studies documenting energy inequalities in the developing world, see Parikh et al, 1997; Reddy, 1997; Karekezi, 1999; Tomlinson, 1999.

25 Barnes, 1995; Alam et al, 1998.

26 Pearson and Fouquet, 1996, p 142.

27 Bartone et al, 1994, p 29.

28 World Bank, 1995; Nordstrom and Vaughan, 1999.

29 See publications by the

Intergovernmental Panel on Climate Change (IPCC, 1995; 1997) for best-guess estimates on the likely consequences of global warming.

30 See World Bank, 1999a, p 97, for tentative estimates of the cost of climate change in developed and developing nations.

31 For reviews of the market-potential of small-scale hydro, wind, and solar energy systems, see World Energy Council, 1994; IEA, 1999; US EIA, 1998; World Bank, 1999b.

32 US GAO, 1999.

33 Murota and Yano, 1993.

34 O'Meara, 1999.

35 US EIA, 1998.

36 IEA, 1999.

37 OECD, 1995, p 203.

38 Johannessen and Boyer, 1999.

39 The following sources provide useful descriptions of fuel cell systems: Elliot, 1997; Geyer, 1999; Fuel Cell Commercialization Group, 1999.

40 Eisenberg, 1999.

41 Jimenez, 1999.

42 For overviews of investments in fuel cell systems made by established electrical manufacturing corporations, see Hojo, 1995; Saito, 1995; Tokumoto, 1995; Moore, 1997; Siemens, 1999; Wald, 1999.

43 For information on the DaimlerChrysler–Ford–Ballard partnership, see Jewett, 1999; for the GM–Toyota partnership, see Brown, 1999; for fuel cell investments by other auto companies, see Ball, 1999; Burt, 1999; Evarts, 1999.

44 See Law, 1999; Siemens, 1999; Yomiuri, 1999.

45 Roe et al, 1998; Revkin, 1999; Trippel et al, 2000.

46 For information on the São Paulo fuel cell study, see Mattos, 1999; on India, see Perumal, 1998; TERI, 1998; Matur et al, 1999; on China, see Cannon, 1998, pp 13–14; on the potential viability of fuel cell powered motor scooters, see Lin, 1999.

47 For cost estimates, see: Grubb et al, 1992; OECD, 1997a; US DOE, 1997; Anderson, 1999; World Bank, 1999b. For the fuel cell cost estimate, see Technology Transition Corporation, 1995.

48 World Bank, 1999b.

49 See OECD, 1995, p 24; 1996, p 112; World Bank, 1999a, p 49; for acknowledgment of the critical need for public–private cooperation in reform efforts.

50 ICLEI was launched in 1990 as the international environmental agency for local governments under the sponsorship of UNEP, the International Union of Local Authorities (IULA), and the Center for Innovative Diplomacy. ICLEI's mission is to build and support a worldwide movement of local governments to achieve and monitor tangible improvements in global environmental conditions through the cumulative impact of local actions. It maintains a formal association with IULA and has official consultative status with the United Nations through which it advocates the interests of local government before international bodies. It works with local government constituents and partners in more than 55 countries. Its web site is www.cities21.com/la21/map/iclei.htm.

51 See Bartone et al, 1994, p 54, and Leitmann, 1999, p 328, for descriptions of the innovative policies pursued in Curitiba, Brazil.

52 World Bank, 1999a, p 150.

53 Pearson and Fouquet, 1996, p 154; WRI, 1996, p 97.

54 Associated Press, 2000a.

55 OECD, 1995, p 131.

56 ICLEI, 1997; Newman and Kenworthy, 1999, p 62.

57 OECD, 1995, p 24.

58 For analyses of subsidies provided to nuclear and fossil fuel sectors, see Michaelis, 1996; OECD, 1997b; World Bank, 1999a, p 90.

59 Barnes, 1995; Alam et al, 1998.

60 Burtraw, 1998.

61 Associated Press, 2000b.

62 Both the Clean Development Mechanism and the Joint Implementation Programmes were created under provisions of the Kyoto Protocol. They are managed primarily by the United Nations, but with significant input from the World Bank. The Clean Development Mechanism is one of the key entities through which emissions credit trades will be carried out. Under the process of credit trading, industrial countries are to get emissions credits by helping developing countries lower their emissions. The Clean Development Mechanism is one of the entities through which officially sanctioned trading can occur. The Joint Implementation Programme is essentially the same thing. It also was created as part of the Kyoto Protocol, and it is another programme through which emissions trading schemes can be carried out. Both of these schemes are new, and few trades have yet been made. Still, they are likely to become the key organizations in emissions trading in the coming years. One useful source that describes recent activities of these programmes is: World Bank, 1999a pp 42, 94, 100–101.

63 US EIA, 1997b, p 46.

64 OECD, 1996, p 149; Martin, 1999.

65 Izagirre, 1998; Bacon, 1999.

66 See Ahmed, 1994, Anderson and Ahmed, 1995, and World Bank, 1999b, for examples of studies published by the World Bank calling for greater support of alternative energy systems.

67 World Bank, 1999c.

68 The Global Environment Facility (GEF) is a programme managed by the World Bank (with significant participation by the United Nations). The GEF provides grants and concessional funds to projects which focus on four target areas: biological diversity, climate change, international waters, and depletion of the Earth's ozone layer. It tries to encourage private companies to carry out these kinds of projects, by providing supporting financing. Although initially a World Bank entity, the GEF has recently become the one of the organizations through which projects from the Convention on Biological Diversity and the UN Framework Convention on Climate Change are managed. One useful source that describes recent activities of this programme is: World Bank, 1999a pp 42, 94, 100–101.

69 UNDP, 1999.

CHAPTER 13

DECENTRALIZATION AND URBAN INFRASTRUCTURE MANAGEMENT CAPACITY[1]

Overview

This chapter reviews a range of infrastructure initiatives implemented since the early 1990s in different economic, social and cultural settings. It assesses recent trends and presents innovative approaches. In each case, the challenges faced and the context within which infrastructure problems had to be addressed determined the range of options and the choice of strategies. The discussion also highlights noteworthy results achieved by Best Practices with a special focus on the ingredients underlying their success.

Decentralization and infrastructure policy

Since the late 1970s, countries in different regions of the world have pursued their own path towards decentralization. These paths have been shaped as much by historical legacy and cultural tradition as by their contemporary administrative structure, political system and economic opportunities. Despite these differences, there is a degree of convergence among the stated objectives underlying the decentralization process:

- reducing disparities among regions, with a special emphasis on rural development in Asian and African countries;
- providing flexibility to respond to the different local and regional problems and opportunities;
- improving local governance through increased autonomy and better accountability;
- mobilizing private resources for local development;
- empowering people in the development of their communities.

Infrastructure plays a key role in achieving these objectives. Regional particularities, ethnic diversity, democratic local governance and the inability of central governments to reach the very poor are driving communities to demand a stronger voice in their own development. In many ways, these same forces are also driving the decentralization of infrastructure services as a critical component of local economic development and the key to improving local conditions.

In the early stages of the decentralization process, an appropriate balance among administrative, political and fiscal aspects has rarely been achieved

Decentralization entails fundamental changes to the structure of intergovernmental relations, involving a shift away from vertical hierarchies to a differentiation of roles and the reallocation of functions among actors operating in the same sector or territory. Political pressures, rather than economic considerations, are driving the pace and degree of devolution. In the early stages of the process, an appropriate balance among administrative, political and fiscal decentralization has rarely been achieved. In Eastern Europe, political autonomy preceded economic decentralization and control over expenditures preceded control over revenues. In Latin America and Africa, political autonomy was granted prior to fiscal decentralization. In this respect, South Africa is a particularly interesting case having institutionalized in 1994 a policy of comprehensive administrative, fiscal and financial decentralization granting a high degree of autonomy to provincial and local governments.

The extent of decentralization depends primarily on the ability of central government to devise an appropriate regulatory framework for central–local relations and its willingness to provide localities with assets and intergovernmental transfers rather than budgetary allocations

Institutions are affected by changes in the macro- and micro-environments within which they operate. Worldwide, since the early 1990s, these contexts have undergone rapid and profound changes. The extent of decentralization depends primarily on the ability of central government to devise an appropriate regulatory framework for central–local relations and its willingness to provide localities with assets and intergovernmental transfers rather than budgetary allocations. These same factors are shaping infrastructure policies and programmes.

Decentralization of infrastructure services

The reallocation of functions related to planning and management of infrastructure typically has been guided by the concept of *subsidiarity*: decisions regarding services should rest with the entity of governance closest to the community that is able to deliver these services in a cost-effective way while minimizing the externalization of environmental and social costs

The reallocation of functions related to planning and management of infrastructure typically has been guided by the concept of *subsidiarity*: decisions regarding services should rest with the entity of governance closest to the community that is able to deliver these services in a cost-effective way while minimizing the externalization of environmental and social costs.

Technological advances in the infrastructure sector have improved the efficiency of providing services for smaller jurisdictions and market areas, thus allowing for a greater degree of decentralization than was possible a few decades ago. This has made it easier for local entities, including private operators and NGOs, to participate in the delivery of infrastructure services. They are now better equipped to respond to community needs, priorities for services and preferences for technology and service standards, thus creating a more direct link between the incidence of benefits and costs.

Decentralization has usually led to increases in public expenditures on infrastructure. Size, diversity, wealth, mobility, income inequality and social exclusion have all been viewed as determinants of increased demand. Issues relating to efficiency, equity, competition and performance are addressed in depth in publications on the economic aspects of infrastructure and decentralization, particularly in current working papers by international and bilateral development aid organizations and other specialized institutions.[2]

The general approach to infrastructure management in decentralized institutional settings is to unbundle service provision in terms of decision-making and management in accordance with the particular characteristics of each service and to allocate responsibilities accordingly. These include the following: network planning, system design, choice of alignments, service standards, project priorities, construction of physical plant and operation and maintenance of services. Regulating, financing and undertaking each of these functions for the different services are important aspects of decentralization and need not be the responsibility of a single actor. The assignment of these functions varies among countries according to institutional and policy frameworks, and also between jurisdictions and communities in response to need, means and the various actors from the public, private and NGO sectors operating at the local level. Coordination among decision-makers and providers concerned with primary, secondary and tertiary infrastructure is intended to ensure the productivity of investments.

Expanding the scope of private sector involvement

Entrepreneurial skills, efficiency in management and the ability to perceive, assess and capitalize on the opportunities created by the decentralization of infrastructure are increasingly prompting the private sector to participate in financing, implementing and managing infrastructure services. The adoption of creative business solutions and innovative financial packages have combined cash flows and negotiated incentives (tax abatements, financial guarantees and concessions) to ensure the profitability of these undertakings.

The government role has shifted from provider to enabler, with an emphasis on the ability to act as:
- **regulator**
- **catalyst**
- **partner**

The privatization of infrastructure has in no way diminished the public role in the sector. At all levels of government, this role has shifted from provider to enabler, with an emphasis on the ability to act as:

- *regulator*, monitoring service quality, ensuring equitable access and limiting monopolistic pricing;
- *catalyst*, providing incentives and streamlining procedures regulations;
- *partner*, contributing to project finance directly or through incentives and credit enhancements.

Partnerships or project-based joint ventures range from outsourcing design and/or construction to private firms; to contracting management of existing systems or granting operating concessions to specialized enterprises; to privatizing new service delivery through build-operate-transfer (BOT) and build-own-operate-transfer (BOOT) agreements; to outright sale of assets to private companies. In contexts of limited public sector resources, BOT and BOOT schemes are increasingly used to finance and build infrastructure (eg dams, national highways, bridges, airports, power plants, sewage treatment plants, bulk water supply and even parking structures). The choice between BOT or BOOT depends on the nature of the infrastructure facility, particularly the feasibility of private ownership and the source of capital cost recovery. Under a BOOT contract, private sector firms are responsible for financing and building a specific infrastructure project. In return, they own and operate the facility through a franchise agreement for a specific period of time. The operating period is typically long enough to allow investors to recoup their capital investment and realize a reasonable rate of return through agreed user-charges. At the end of the period (10–30 years on average), the ownership is transferred back to the government.

A growing role for NGOs and civil society

Pervasive difficulties in securing financing for infrastructure investments and in building the capacity of local governments to deliver services in many parts of the developing world have prompted poorer households to seek access to services through collaborative action at the community level. This situation is leading to a gradual shift towards partnerships between local governments, NGOs and CBOs. In many ways, these partnerships are the hallmark of the infrastructure projects highlighted in this report and constitute the cornerstone of successful local development initiatives.

Challenges in the decentralization of infrastructure

Paralleling the common features outlined above are recurrent challenges which central and local governments in different countries and regions have to address:

- Overcoming a tradition of centralized administration entrenched through state control, colonial rule and centralized planning systems. This legacy is reflected in regulatory and fiscal controls, which can still be rigid enough to constrain local government's ability to exercise statutory powers. In particular, the reluctance of central governments to devolve control over revenues and the allocation of resources has adversely affected infrastructure services.
- Balancing the emphasis placed on economic growth and industrialization guided by central agencies with concerns for social equity and inclusion, which are best addressed at the local level.
- Tempering the priority given to managing the macroeconomy, especially in the aftermath of debt or financial crisis, to give localities a space for innovation and creativity. Even in decentralized systems, monetary and fiscal policy has tended to reinforce central oversight through targeted transfers, curbs on borrowing, caps for particular categories of expenditures and limits on discretion to reallocate funds among budget categories. All of these policy measures affect local capacity to implement infrastructure projects.[3]
- Addressing problems of coordination among public agencies, private enterprises, NGOs and CBOs delivering services within the framework of integrated local development programmes.
- Reinforcing the capacities of local governments and communities to discharge the responsibilities devolved to them as their role expands in a decentralized institutional setting.
- Building awareness among local representatives and community leaders of the broader economic, social and environmental issues which are affected by infrastructure decisions.
- Putting in proper perspective concerns regarding the ability of local leaders and officials to pre-empt or influence resource allocation decisions to serve their own private interests. These concerns should not be allowed to overshadow the fundamental role of civil society in defining priorities, allocating resources and managing services at the community level.

Most localities in developing countries are ill-equipped to address these challenges. Demographic pressure in South Asia, sharp fluctuations in the domestic economy and urban violence in Latin America and political instability and civil strife in Africa are exacerbating deficiencies in infrastructure, inequities in access to services, environmental degradation and the lack of funds for capital investments.

Several recent initiatives addressing these challenges are described in the following sections, grouped under three main themes:

1 Decentralized institutional frameworks, participatory processes and capacity building.
2 Financing investments in infrastructure: the expanding scope for intermediary institutions and public/private partnerships.
3 Equitable access to infrastructure and the empowerment of poor and marginalized communities.

Decentralized Institutional Frameworks, Participatory Processes and Capacity Building

Development banks, international and bilateral organizations and donors have been the traditional source of funding for large infrastructure projects in developing countries and transitional economies directly or through financial intermediaries, particularly municipal finance institutions. These organizations have had and continue to have a major influence on decentralization, infrastructure policies and municipal development programmes. Funding is often linked to reforms in fiscal and administrative policies affecting intergovernmental relations and the promotion of market-oriented approaches to infrastructure provision and delivery of urban services. These organizations have displayed a marked preference for the creation of special institutional arrangements and entities to oversee implementation of agreements if not directly implement projects.

Working outside the existing framework of agencies allows the programmes they sponsor to proceed unencumbered by bureaucratic red tape and interference. It also insulates the special purpose entities from the politics and activities of other actors operating within the same geographic or sectoral territory. The special status these entities often enjoy hampers their integration into existing institutional frameworks, thereby compromising their efficiency and viability in the longer term.

Bi- and multilateral organizations have reoriented their approaches to include a range of institutional arrangements emphasizing the role of intermediary institutions capable of managing programmes that meet international guidelines, procedures and scrutiny

As they have moved away from sectoral to integrated approaches promoting sustainable development, and poverty alleviation and environmentally sound management of natural and cultural resources, international and bilateral organizations have sought improved performance and accountability in governance, increased participation by the private sector, and a larger

role for civil society in the development process. They have gradually reoriented their approach to include a range of institutional arrangements emphasizing the role of intermediary institutions capable of managing programmes that meet international guidelines, procedures and scrutiny. These new approaches focus on building the capacity of local government and encouraging participatory processes.[4]

The role of regional and intermediary institutions

Worldwide, infrastructure programmes of significant scale have highlighted the need for partnerships among the different levels of government, intermediary institutions and community-based organizations. Strengthening the role and capacity of regional entities enhances their effectiveness as sponsors, partners, catalysts and facilitators in local development and infrastructure programmes.

The Municipal Development Project in Sindh, Pakistan, built up the role of the provincial government to provide an enabling environment for fragile municipalities which have to rely on their own resources to finance their development expenditures. Alarming deficiencies in infrastructure hindered the implementation of local development programmes, resulting in a marked decline in the region's GDP. By streamlining operations to improve the efficiency of public expenditures and discontinuing the practice of overdrafts to finance operating deficits, the provincial government redirected resources towards the long-term finance of productive infrastructure. In Karachi, water supply projects involved local elected representatives in decision-making and enlisted their efforts to reach out to their constituencies. This strategy increased willingness to pay for services, as the quality of these services improved. Collection rates have increased despite a fourfold increase in the average water charge over five years.

In the face of mounting deficiencies in its infrastructure services, the municipality of Bauan in the Philippines decided to participate in the national Municipal Development Programme (MDP) to build its capacity to deliver services and access financing. Prior to seeking funding for specific projects, the municipality opted to first build its institutional capacity and adopt effective managerial and fiscal procedures meeting MDP criteria. Participation in the MDP enabled the municipality to engage in sound investment planning for the effective expansion and upgrading of its infrastructure. A demand-driven approach to project selection ensured responsiveness to local needs and priorities, greater impact on the local economy and high levels of performance by the local government units (LGUs) responsible for preparation and implementation of the selected projects.

The commitment of stakeholders was crucial to success. A participatory approach to local governance allowed LGUs to prepare investment proposals reflecting local needs and priorities. Rather than pre-selecting projects likely to be financed by the MDP, only those projects prepared by the LGUs were submitted for funding. Improved distribution of piped water supply reduced the incidence of water-borne diseases. Improved roads, drainage and flood control systems resulted in greater accessibility and increased property values. Market facilities and stalls were upgraded, enabling vendors to expand their activity. The rate of return for the project exceeded the 10 per cent lower bound established by MDP and reached close to 14 per cent for the public market component.[5]

Strengthening local government leadership and initiative

Decentralization has given local governments the discretion and scope they need to take a lead role in responding to the challenges of economic downturn, degradation of the urban environment and social hardship. They institute bold initiatives and innovative practices. Western European nations have put in place sophisticated frameworks to provide local governments with technical and financial assistance. The European Union supplements these national programmes with coordinated assistance aimed at promoting economic development, assisting distressed localities and fostering social inclusion. Infrastructure is an important component of these programmes.[6]

In Jerez de la Frontera, Spain, strong local government leadership and active community participation were key to implementing an integrated plan involving urban planning, infrastructure and economic development. Despite its location in an industrialized province, Jerez' economy relies on wine production which, in recent years, has been declining. Weak community participation, inadequate infrastructure, poor accessibility to regional resources and an unskilled labour force compounded the effects of massive job cuts in the wine industry. To address these problems, Jerez launched a new strategy for economic recovery in 1993, shifting the emphasis from seeking to attract investments from sources outside the municipality to fostering local integrated development.

The 1993 integrated plan calls for economic diversification, and improved infrastructure and communications. The strategy seeks to capitalize on the development of an airport, logistics hub and railway terminal, and improve existing roads connecting Jerez to Cadiz to facilitate access to the region's resources. With regard to economic development, the project focuses on the development of cultural tourism and the promotion of entrepreneurial activities.

Access to structural funds for economic reconversion from the European Union enabled Jerez, Spain, to implement an integrated development strategy, improving infrastructure and enhancing the local environment. Unemployment fell by 8000, the number of tourists increased to 120,000 and 4600 jobs were created.

Access to structural funds for economic reconversion from the European Union allowed Jerez to implement an integrated development strategy, improving infrastructure and enhancing the local environment. Unemployment fell by 8000 from 1991 to 1992, the number of tourists has increased to 120,000 and 4600 jobs have been created in the

small business sector. Underlying Jerez' success are seven key factors:[7]

1 A dynamic local government leadership.
2 A coherent strategy, acted on with determination.
3 A healthy climate of cooperation with business.
4 Local government's investment initiatives to jump-start the stagnant economy.
5 Creative use of EU funds to implement local policy.
6 Efficient municipal administration.
7 Coherent links between urban planning, infrastructure and economic development.

Partnerships between municipalities and NGOs

Partnerships with municipalities have provided the best channel for the participation of communities in the organized delivery of public services and paved the way for the growing role of NGOs and CBOs in this sector in urban and rural areas and different regions of the world.[8]

Albania, one of the smallest and poorest countries in Eastern Europe, has experienced a transition marked by sharp economic swings and periods of civil strife. The early phases of decentralization witnessed the transfer of political autonomy, and limited administrative and fiscal authority to local governments. Inadequate legislation outlining central/local responsibilities, scarce financial resources and deficient infrastructure strained the capacity of local governments to manage urban services. In Tirana, sustained population growth since 1991 led to rapid expansion of the urbanized area, resulting in the proliferation of informal settlements. With an estimated population of 575,000 in 1997, 6500 families were seeking new housing each year. Local government, even with central transfers, could accommodate only 5 per cent of the demand for new infrastructure.

In the absence of fiscal resources to improve infrastructure in urban and rural areas, the government, with donor assistance, initiated community-driven development strategies to provide infrastructure services based on a cost-sharing formula and to set up participatory management structures. In January 2000, the government promulgated a national Strategy for Decentralization and Local Autonomy, which includes laws to strengthen the autonomy of local governments and increase their capacity to manage local infrastructure and services. Supported by donor assistance and international and local NGOs, the city initiated a community-based development strategy in the informal settlement of Berglumasi in Tirana. The programme brought together local government teams, NGOs and residents to formulate a development plan for the neighbourhood, define priorities for improvements and determine equitable cost-sharing formulas to finance infrastructure. This partnership led to the upgrading of roads and electrical networks, the construction of community buildings and schools, improved public spaces and programmes for youth. Clarifying the legal status of residential land and formalizing an urban plan resulted in the sufficient leveraging of community and household resources to provide infrastructure and build new housing.

In 1997, the experience was expanded to a city-wide effort and was subsequently funded by the World Bank. As the local government teams and NGOs gain experience and residents begin to trust the local government, the Tirana Land Management Programme is scaling up and expanding to other formal and informal residential zones in Tirana.[9]

Similar community-based initiatives were structured in rural areas in Albania. As part of an IDA-funded Irrigation Rehabilitation Project, 250 Water User Associations (WUAs) were created to manage irrigation and drainage systems. In 1997, the government permitted the transfer of primary system management responsibilities to WUAs on a pilot project basis. To date, three pilot projects involving 31 WUAs have been implemented. Service has improved and cost recovery increased through cost sharing. An effective local leadership has emerged, capable of managing water resources and ensuring equity in the allocation of water rights. Building the capacity of the WUAs and allowing them to set irrigation charges restored trust in partnering with government. Finally, the engagement of senior government officials in the dissemination of project information secured commitment among communities and farmers. By mid-1999, the project had positively impacted agricultural production and increased rural incomes by an estimated US$400 to 600 in the average annual income of a farm family.

In the more challenging context of sub-Saharan Africa, Tanzania's Local Government Reform Act of 1996 granted local governments a high degree of autonomy with some control over financial resources. Donors are funding 96 per cent of the cost of the reform through a centrally administered Common Basket Fund channelling resources to local authorities. However, the inability to generate local revenue has undermined the effectiveness of local government. To address this challenge, the city of Dar es Salaam has adopted a 'Two-Point Strategy', incorporated in the Community Infrastructure Programme (CIP):

- to work closely with community-based organizations so as to enhance their capacity to participate in development programmes and strengthen the city council's capacity to respond to requests from communities;
- to adopt a new approach to environmental planning and management based on capacity building.

The CIP upgraded infrastructure, enhanced participation and built the capacity of CBOs and stakeholders. The CIP strengthened institutional capacity by establishing programme offices in each community, forming steering committees made up of representatives from all stakeholder groups and formalizing institutional links between the relevant partners and communities through memoranda of understanding. Adequate and transparent information for decision-making and monitoring of performance among the stakeholders altered attitudes and understanding of roles and responsibilities. Communities have agreed to earmark part of their incomes towards the improvement of infrastructure. Involving CBOs and other stakeholders as

partners in urban development ensures the sustainability of these assets.[10]

Community-based approaches to infrastructure services and neighbourhood revitalization

Democratic local governance is a prerequisite to the meaningful decentralization of infrastructure management

Democratic local governance is a prerequisite to the meaningful decentralization of infrastructure management. When people participate in defining visions for sustainable development for their communities, in formulating strategies for equitable access to services and resources and in setting priorities for action, they readily commit to support the activities they have endorsed. Participation also sharpens their awareness of the interrelations between economic, social and environmental issues. This is a highly significant feature of infrastructure programmes and carries important implications for local development.

Poland is viewed as the flagship of Eastern Europe with regard to decentralization. In 1990, Poland passed the Law on Local Self-Government, granting autonomy to local governments. Specifically, the law transferred to municipalities the authority over housing, health services, social assistance, energy and heat, local transport systems, water supply and sanitation, kindergarten and primary education, public order and fire protection, land use and environmental protection. Sustained political pressure and the demonstrated capacity of municipalities to manage their responsibilities were the driving forces for local administrative and fiscal autonomy. Initial assessments suggested that decentralization did improve the quality of service delivery and foster a new, user-oriented attitude, facilitating the transition from a centrally planned to a market economy. In 1998, Poland adopted a set of reforms to enhance regional development and democracy through the creation of new regional and subregional entities and the reassignment of responsibilities and roles. Sixteen regions and 272 counties were established as a coordinating framework for the 2489 municipalities. These reforms increased the proportion of public funds controlled by democratic local institutions from 20 per cent to 60 per cent.

The creativity and commitment of municipal councils and staff since 1990 is demonstrated in the experience of Lublin, Poland. Two lower-income neighbourhoods – Bronowice and Kosminek, housing a population of 6000 – had suffered progressive deterioration. Dwindling central transfers and tight budgets necessitated the mobilization of community resources to improve the urban environment, a new approach in Eastern Europe. The main objective was to build a new working relationship between residents and city officials, based on a shared vision of the future and 'a lasting trust'. Because the districts had been designated as urban renewal sites, residents in the older zones could not upgrade their infrastructure and households in the unserviced extensions could not connect to existing networks. Repairs to buildings were also prohibited, except in the case of roof leaks. This state of affairs lasted over 30 years, resulting in resentment and distrust of municipal authorities.

In 1992, the city's Urban Planning Unit decided to initiate a participatory process to rehabilitate and revitalize the districts. The process required an extensive outreach effort, involving consultations with every household. Regularly scheduled public meetings were held and, gradually, residents became aware of the role they could play in shaping the future of their neighbourhood. The city council subsequently adopted a new strategy to stimulate local investment in infrastructure and buildings based on partnership between the city and the residents. The Act for Support of Local Investment committed the municipality to cover 50 per cent of the cost of water, sewerage and power lines, 70 per cent of the cost of roadbeds and sidewalks and 100 per cent of the cost of drainage and street paving. The cost-sharing formula could be modulated to take into consideration issues of equity and cost burden. As an incentive to private rehabilitation of buildings, investors were granted a three-year exemption from property taxes.

The partnership between the municipality and the residents was institutionalized through the Local Initiatives Programme to ensure its continuity as a city-wide development strategy. The key features of the programme are:

- introducing participatory planning and community-based development processes through neighbourhood development committees and street representatives working in partnership with the city;
- creating an enabling environment for private investment;
- empowering citizens to pursue their own self-improvement;
- promoting privatization of the housing stock and fostering the development of micro-enterprises;
- ensuring the sustainability of activities initiated; and
- promoting the replicability of successful initiatives.

As of 1998, 391 existing houses have been partially or fully renovated and 87 new ones have either been completed or are in advanced stages of construction. Only six shops existed in the neighbourhoods before regularization; today, 123 shops are operating in rehabilitated buildings. The changing image of the area is attracting private developers and investors interested in vacant parcels close to the city centre.

Lublin's Local Initiatives Programme demonstrates that community-based development processes adapted to the dynamics of the local economy can ensure the sustainability of infrastructure upgrading and economic revitalization efforts through strategic public investments, partnership with the community and empowerment of residents.[11]

In Latin America, widespread inequities in access to land and infrastructure have contributed to the proliferation of unserviced settlements, uncontrolled squatterization in hazardous zones and encroachments of environmentally sensitive areas. Widening disparities in the distribution of income and wealth are aggravating poverty and exacerbat-

Box 13.1 Democratization of municipal management for equitable and sustainable development in Cotacachi Canton, Ecuador

In 1996, the first Indian elected official in Cotacachi Canton, Ecuador, initiated a citizen participation process to promote equitable and sustainable economic development, fight poverty and improve standards of living. The Canton Unity Assembly was established as a forum to bring together the different stakeholders from urban and rural areas to discuss problems, propose strategies, define priority actions and prepare a 'Canton Development Plan' with technical assistance from the Urban Management Program in Latin America (PGU/LA). The first Assembly met in September 1996 and brought together around 250 participants, representing the different interest groups in the Canton.

At its annual meeting, the Assembly elects the Canton Development and Management Council, responsible for monitoring compliance with guidelines set by the Assembly and updating the Development Plan. The Assembly also evaluates performance, defines policy guidelines for each budget year, and assigns roles and responsibilities among the different participants, including the municipality and the different community groups, with an emphasis on citizens' contribution.

In the initial phase, the stakeholders discussed the problems and challenges facing their Canton and classified them in four categories. Infrastructure was a key aspect in each category. *Social problems* included illiteracy, worsening health conditions, out-migration, fragmentation along ethnic lines and isolation due to deficiencies in infrastructure, all of which created a lack of social cohesion and a deep sense of insecurity. *Economic problems* affecting productivity included small indigenous farm-holdings, limited production and marketing capacity, lack of access to credit and deficiencies in infrastructure. The latter affected living and working conditions, particularly in rural areas, and hampered the potential for environmental and cultural tourism. *Environmental problems* included river pollution and inadequate river basin management, deforestation and deficient solid waste management in populated centres. Finally, *administrative problems* included lack of technical capacity, low level of citizen participation and inadequate municipal resources. Workshops and zonal meetings, held over an eight-month period, built the consensus needed to prepare the Cotacachi Canton Development Plan. The document is a strategic framework guiding action and it is constantly updated with contributions from the different sector committees.

Five committees, referred to as 'Sector Harmonization Tables' were structured to work on priority sectors: health and education, tourism and production, environmental and cultural resources management and community organization. The five committees present proposals and priority actions to be incorporated in the Development Plan. Their inputs resulted in the implementation of several development projects. The participatory process has been institutionalized, and the Canton Unity Assembly was legalized by a Municipal Ordinance enacted in January 2000.

Equitable participation of the different stakeholders is ensured, with a special emphasis on the representation of women, rural people, marginalized groups and children and youth. Women's participation was 40 per cent in the Assembly and 20 per cent in the Development and Management Council membership. Historically marginalized groups, such as the *mestizo* and black communities, are equitably represented in the Assembly and Sector Committees, as are geographically isolated inhabitants of remote rural parishes. Finally, a special 'Children and Youth Table' has been formed and the Canton's First Children's Congress is being organized.

The size of the municipal budget doubled as international organizations and, more importantly, the community itself contributed funds for social investment projects. At present, municipal funds cover 57 per cent of the total budget, support from international organizations 27 per cent, and community contributions 16 per cent. A large proportion of the resources are being allocated for priority infrastructure projects to improve living conditions. The participatory process succeeded in building consensus on issues of cost and quality, and potable water rates were increased to improve the service. In 1997, sanitation was declared a primary concern and resources directed towards investments in sanitary improvement and community health programmes. Most recently, ecology came to the forefront and additional resources have been allocated for the sustainable management of natural resources.

In June 2000, the Cotacachi initiative received international recognition through the UNCHS/Habitat Best Practices and Local Leadership Programme as one of 10 Best Practices worldwide in improving the living environment.

ing the marginalization of vulnerable segments of the population. In this context, access to infrastructure services is a critical component of strategies fostering poverty alleviation and social inclusion.

The Cotacachi Canton ranks among the three poorest zones in Ecuador, with 80 per cent of the Canton's population of 35,000 living below the poverty line, mostly in rural parishes and scattered remote settlements. Lack of access to land and the ongoing process of fragmentation of family holdings have led to widespread poverty, prompting out-migration. To meet these daunting challenges, the Canton democratized its planning and management procedures. This process allowed the Canton to build consensus, prepare a development plan, allocate municipal funds equitably, leverage additional resources and improve infrastructure and living conditions. The participatory municipal management process was institutionalized, ensuring representation of women and marginalized groups (See Box 13.1).

Financing Investments in Infrastructure: The Expanding Scope for Intermediary Institutions and Public–Private Partnerships

Devolving the management of infrastructure to local governments without granting them an adequate tax base to support the associated costs has led to serious service deficiencies or total collapse of the systems and loss of physical assets as a result of overload and lack of maintenance

Devolving the management of infrastructure to local governments without granting them an adequate tax base to support the associated costs has led to serious service deficiencies or total collapse of the systems and loss of physical assets as a result of overload and lack of maintenance. Similarly, decentralizing services, requiring high levels of expenditures on operation and maintenance, can burden municipalities with demands exceeding their managerial, financial and technical capabilities. Furthermore, integrated local development programmes require municipalities to simultaneously implement several projects, which can overwhelm local institutional capacity, compromising sustainability of development efforts.[12]

Partnership for joint service provision by different levels of government, combined with capacity building and resource management programmes, is a viable strategy in the shorter term. It allows for a progressive increase in the local component and in the involvement of communities. Assurance of commitment and leverage from higher levels of government encourages the private sector, including commercial banks, to participate in project financing. Central and provincial support to municipalities has usually taken the form of capital grants for specific infrastructure

projects or particular categories of capital expenditure. To attract private investment, tax incentives, credit enhancements and guarantees have been widely used.

Feasibility studies for larger projects usually include an assessment of life cycle costs. Operation and maintenance implications can then be matched with the revenues which entities assuming responsibility for the service can realistically be expected to generate. When revenues fall short of covering the recurrent expenditure on operation, maintenance and debt service (if any), central or provincial governments have to fill the gap at least in the short term. This situation, allowed to continue over prolonged periods, has cumulatively led to increased national budget deficits, prompting curbs on the fiscal discretion of local government. A resource mobilization strategy has to be put in place to ensure continuity in the delivery of services and sustainability of the infrastructure assets.

Public–private partnerships to finance infrastructure

Public–private partnerships have come to the forefront as an effective mechanism to attract private investment and mobilize local resources. In China, decentralization has allowed localities to experiment with different infrastructure financing schemes, backed by liberalizing legislation of the water sector. Decision-making powers have been reallocated across the five layers of government: national, provincial, prefectural, county and community. Regulatory and planning authority has remained with higher levels of government responsible for capital investments. Management and maintenance are assigned to the lower levels (counties currently manage 77 per cent of all projects). The Water Policy Act of 1988 regulated use rights and payment and maintenance responsibilities of users. The Water Industry Policy Act of 1997 offered incentives to private businesses to participate in the water sector, thereby enabling the establishment of financially independent utilities through public–private partnerships.

The City of Chengdu has taken advantage of these liberalizing acts to finance badly needed investments to the water supply system. Sponsored by the Asian Development Bank, the Chengdu water supply project is the first BOT project in China. CBDEM, a joint-venture company between the French Compagnie Générale des Eaux-Sahide and Manubeni Corporation of Japan, will design, build and operate the system (See Box 13.2).

Partial government guarantees reduce the financial risks perceived by private sector institutions. In fragile economic and institutional settings, they are an effective instrument to induce the private sector to enter into partnerships with public agencies.

Sub-Saharan African nations face a growing imbalance between the demands for services required by population growth and rapid urbanization, and the financial resources they are able to mobilize. Infrastructure deficiencies have adversely affected economic development and are particularly acute in urban centres where large concentrations of poor households live in slums and squatter settlements. The challenge is to increase the very low current rates of mobilization and leveraging of local resources, and use available funds effectively to promote local development. Investment in upgrading and expansion of infrastructure systems as well as operation and maintenance of urban services are critical to the success and sustainability of this development effort.

In Angola, the population of Luanda has grown from 470,000 inhabitants in 1975 to more than 3 million today at an annual rate of 7 per cent. The living environment deteriorated for lack of infrastructure, urban services and housing. Chaotic urbanization degraded the natural environment and endangered the health and safety of the inhabitants. The scarcity of financial resources made it very difficult to address these mounting problems.

In 1993, an innovative partnership between government agencies Empresa de Desenvolvimento Urbano Lda (EDURB), the private sector and the community, referred

Box 13.2 Public–private partnerships in Chengdu, China

With 3 million urban residents, Chengdu is the political, cultural, financial and educational centre of southwest China. Located between the Fu and Nan Rivers, Chengdu relies on both the Duijiangyan Irrigation System and Yangtze River System for its water needs. During the 1990s, increasing agricultural and urban demands on water, arising from rapid growth, liberalization and industrialization, transformed Chengdu into one of the most polluted cities in southwest China. Industrial effluent, raw sewage and intensive water usage created severe shortages, undermined water quality and caused widespread environmental damage. Squatter settlements on the river banks exacerbated the situation.

Chengdu adopted the 'Fu and Nan Rivers Comprehensive Revitalization Plan' in 1993 to strategically guide the use of water to meet social, environmental and economic objectives. A major section of the river has been rehabilitated through the renovation of bridges, drainage channels and dykes and improved oversight of more than 1000 polluting enterprises. Affordable housing has been provided to resettle 30,000 squatter households. Thirteen new public parks have been created along the river banks, transforming the banks into recreational open space.

In a first phase, the municipality earmarked a substantial portion of its annual budget to meet the project's cost of US$360 million. It established partnerships with public organizations, schools, education and research institutions, neighbourhood associations and private investors, including real estate developers and construction companies. In the second phase, the municipality is experimenting with the first BOT project in China. Sponsored by the Asian Development Bank, the project involves the construction of a water treatment plant. CBDEM, a joint-venture company between the French Compagnie Générale des Eaux-Sahide (a member of the Vivendi Group) and the Manubeni Corporation of Japan will design, build and operate the plant which will increase Chengdu's potable water supply by 40 per cent. The distribution network will be expanded beyond the 1.8 million people currently served.

The utilization of local resources and the participation of stakeholders in project development and implementation were seen as crucial to its success. The municipality established a framework for the participation of representatives from the planning, construction, land administration and environmental protection departments, business enterprises, schools, neighbourhood committees, scientists, community organizations and residents in the development of a vision for a sustainable future. In all, more than a million people participated through 188 neighbourhood committees and 1291 enterprises and institutions. The city then strategically deployed its own resources to ensure financing of the infrastructure services it required.

In June 2000, Chengdu was selected as one of 10 Best Practices worldwide to receive an award for excellence in improving the living environment under UNCHS/Habitat Best Practices and Local Leadership Programme. Separately, the International Council for Local Environmental Initiatives (ICLEI) presented Chengdu with the 'Local Initiatives Award for Excellence in Freshwater Management'.

to as the Luanda Sul 'Self-Financed Urban Infrastructure Programme', was established to finance and implement badly needed infrastructure services in Luanda. The concept is to grant concession of titles to land and use the private funds mobilized to finance the infrastructure (primary, secondary and tertiary) needed to service the sites. A special Achievement and Management Fund capitalized by receipts from land sales was set up to finance servicing costs.

Laws were enacted to privatize and restitute land formerly held by the state. The provincial government issues land titles in coordination with EDURB, which manages the programme. In turn, EDURB relies on the technical expertise and entrepreneurial skills of its private partners (Odebrecht and Prado Valldores) who prepared the programme's financing strategy and business plan and are managing and coordinating land disposal and development in the different sectors of the city.

The strategy was to start by serving the affluent clients capable of prepaying their serviced parcels. The surplus profits after payment of developers' fees and return on investment are used to finance servicing of plots for lower-income households who do not have accumulated savings to contribute. The combination of legal guarantees regarding title to land offered by the state and a sound business plan submitted by the private developer convinced oil companies to prepay the purchase of serviced parcels to house their employees, experts and managers. This prefinancing provided the programme with start-up capital. Bulk infrastructure had to be constructed to service the selected sites and the developer had to contribute supplementary funding to complete the water supply system. The infrastructure included access roads, potable water, electricity, storm water drainage and sanitary sewerage to support development at the standards demanded by the clients.

The social component of the programme started with a pilot scheme to resettle 860 families living in shacks in hazardous areas and security zones in downtown Luanda. Today, over 2700 families have been resettled. Service charges for water and electricity are deposited in a Replacement Fund to ensure sustainability of the services provided.

In December 1999, contracts totalling US$85.6 million had been signed and US$96.3 million in infrastructure investments committed, of which US$16.4 million were allocated to the programme's social component. Eight million square metres have been fully serviced, 4000 jobs were created and local tax revenue has increased. The urban environment is improving through planned urban expansion, revitalization of the city centre, rehabilitation of public spaces and protection of the natural landscape and vegetation. Most importantly, the programme created a formal, private real-estate market which was nonexistent in Angola. It then capitalized on the dynamics of this market to valorize the public land assets it held and to leverage funds based on the future value of the serviced land.[13]

Box 13.3 FINDETER, Colombia: an innovative municipal development fund

Financiera de Desarrollo Territorial (FINDETER) partially rediscounts loans granted by commercial banks to municipal borrowers. The banks can borrow from FINDETER up to 85 per cent of the value of loans they extend to municipalities and other sub-national entities. FINDETER's intervention allows commercial lenders to balance the maturity of assets and liabilities and enhances their liquidity. However, the banks assume the credit risk associated with their municipal borrowers since FINDETER does not purchase the loans but rather recapitalizes the institution with liabilities having appropriate maturities. In addition to second-tier lending, FINDETER manages the national government's matching grant programme for infrastructure projects including water, roads and schools.

FINDETER, which inherited the staff, experience and project pipeline of its predecessor MDF, has reached close to two-thirds of Colombia's 1000 municipalities in its first three years of operation. It has refinanced loans for the rehabilitation, improvement or expansion of urban infrastructure and services including water, sewerage, roads, traffic management, environmental protection, drainage and flood control, solid waste, slum improvement, education and health facilities. Water, sanitation and roads account for 75 per cent of loan disbursements, institutional development 8 per cent, and schools 6 per cent. Projects must meet specific criteria regarding developmental and environmental impacts to be eligible for FINDETER refinancing.

In addition to its own capital consisting of retained earnings, loan repayments and borrowing from international institutions such as IBRD and IDB, FINDETER issues bonds on the domestic capital market to raise funds and has to offer competitive yields. Despite owning 86 per cent of FINDETER's shares, the national government does not guarantee the bonds. In addition, unlike its predecessor FFDU, local governments and financial intermediaries are not compelled to buy FINDETER bonds by regulation or in order to obtain borrowing privileges.

FINDETER loans carry a variable interest rate and borrowers are charged a service fee. The institution fully covers its operating costs, foreign exchange and credit risks, and produces a positive return on investment. Several measures substantially reduce risk. Commercial banks are liable to FINDETER if their borrowers default, and municipal revenue, pledged as loan guarantee to the banks, can be used to repay FINDETER. Furthermore, the percentage of municipal revenues which can be pledged is capped and lower bounds are set on debt service coverage ratios. Municipal infrastructure loans cannot exceed a maximum loan-to-value ratio of 70 per cent, and a municipality which defaults on a FINDETER-backed loan cannot access new funding through FINDETER.

While the dependence of larger municipalities on FINDETER has decreased as they manage to access competitive financing from commercial banks, FINDETER's mission remains critical to small- and medium-size municipalities. Given its development mandate, FINDETER offers technical assistance on project design, including the development of business plans, financial forecasts, loan application requirements, and implementation, particularly with respect to contracting and procurement. Larger and fiscally stronger municipalities have managed to secure financing with competitive spreads. To protect the smaller municipalities, FINDETER sets a ceiling on the maximum interest rate banks can charge on the loans it refinances.

The role of intermediary institutions in infrastructure finance

In Latin America, decentralization has fostered creative initiatives involving intermediary institutions and NGOs. In Colombia, decentralization has given municipalities strong revenue generation powers. Conversely, they have assumed the responsibility for urban services including water and sanitation, streets, education and health. Despite improvements in the volume of local revenue and large increases in central transfers and in the local share of national taxes, municipalities are unable to access long-term credit for capital investments on the domestic capital market. Financial intermediaries holding mostly short-term liabilities are reluctant to provide long-term financing, especially to municipalities with no track record of administering long-term debt. To address this problem, in 1990 Colombia restructured its Fund for Urban and Infrastructure Development (FFDU) which operated from within a mortgage bank and established a Municipal

Development Fund (MDF), known as FINDETER (*Financiera de Desarrollo Territorial*), sponsored by the Inter-American Development Bank (IDB) and the World Bank.

FINDETER differs from conventional MDFs, through which central government channels subsidized credit to localities, in that it does not lend directly to municipalities. It is a second tier lender operating through the banking sector by partially rediscounting loans granted to municipal borrowers (See Box 13.3).

Privatization of infrastructure services: public utility companies

Decentralization and privatization are integral components of the process of transition from a centrally planned to a market economy. In Eastern and Central European countries, local autonomy has been a fundamental principle of governance since 1990. Public assets and enterprises are being privatized and the scope for private participation in the infrastructure sector is further enhanced by the progressive dismantling of central regulatory controls. Unlike transitional countries in the Commonwealth of Independent States (CIS), Central European nations have invested heavily in their infrastructure. Despite these substantial investments, their infrastructure needs to undergo serious modernization and renovation to enable them to compete effectively in the global marketplace. Privatization is being increasingly used as the choice instrument to improve efficiency in the management and operation of services and leverage the financial resources needed to upgrade the quality of the physical plant.

In Romania, public service corporations were transformed into commercial utility companies and public subsidies are being phased out. Privatization has compelled the public utilities to seek more efficient and cost-effective approaches to service delivery and establish partnerships with various stakeholders.

The city of Brasov in Central Romania had to deal with ageing infrastructure and artificially low utility rates which did not cover maintenance and operation costs. Changes in operation and management of water and wastewater services were needed to gradually move towards European environmental quality standards. A utility company, the Regii Autonome, was created to manage the services. Technical modifications to water filtration increased water production, and wastewater treatment was improved by the installation of a low-cost aeration system meeting national environmental standards. Monitoring and planning is supported by a computerized water evaluation system. Finally, changes to the organizational structure improved administrative efficiency.

The success of the Regii Autonome is attributed to the partnerships established among various stakeholders in planning for the improvement of services. The Brasov County Council, the Brasov Prefecture, other municipalities within the region, government departments and agencies, the University of Transylvania, public-owned societies, business representatives and the Chamber of Commerce and Industry participated in the planning of improvements. The European Bank for Redevelopment and Reconstruction, local finance institutions and intermediary NGOs provided technical and financial support. An open communication channel facilitated the implementation of an operational plan requiring the city to approve significant increases in utility rates.

Equitable Access to Infrastructure and the Empowerment of Poor and Marginalized Communities

Access to land and infrastructure is a powerful empowering mechanism, enabling impoverished and marginalized citizens to improve their income and their living conditions through self-reliance

Access to land and infrastructure is a powerful empowering mechanism, enabling impoverished and marginalized citizens to improve their income and their living conditions through self-reliance.[14]

Rural development programmes were among the first to focus on the economic and social impacts of infrastructure. These programmes have included infrastructure services crucial to the development effort, starting with water supply and electrification and extending to education and health facilities. Decentralization has resulted in greater involvement of rural populations. In India, the process has included the devolution of administrative and financial powers to the units of governments closest to the people. Despite the slow pace of change, local public officials have started to pay greater attention to the needs of the rural poor.

Indonesia's Kampung Improvement Programme has, over the course of 25 years, upgraded 11,000 ha of unserviced slums and improved the living conditions of 15 million people

Among urban programmes, the most widely recognized is Indonesia's Kampung Improvement Programme which, over the course of 25 years, upgraded 11,000 ha of unserviced slums and improved the living conditions of 15 million people. A programme of similar magnitude has been launched in 1996 in South Africa where overcoming the legacy of apartheid is a daunting challenge. These initiatives are in line with a new initiative, 'Cities Without Slums', being carried out by a broad-based coalition of partners headed by UNCHS (Habitat) and the World Bank.

South Africa's geographic size, ethnic diversity and differences in development levels among regions and localities made decentralization the best approach to ensure responsiveness to local needs and opportunities. Local governments can legally set rates for user charges and property taxes, and leverage resources by entering into partnerships with the private sector. Redistribution policies

Box 13.4 The South African Government's grant-funded municipal infrastructure programme

The South African municipal infrastructure programme, launched in 1996, is one of the largest and most ambitious in the world. The programme's mission is to 'ensure that all communities have access to at least a basic level of service'. The government views municipal infrastructure as a critical component of local development, and the most effective mechanism by which poor and marginalized communities can be empowered. The aim is to promote five key objectives:

1 upgrading the living environment;
2 promoting social equity;
3 integrating former apartheid cities and towns;
4 enhancing economic opportunity;
5 fostering partnership to leverage inputs.

The government made a strategic decision to create a grant-funded programme in order to reach the poorest 20 per cent of the population. The programme serves urban and rural communities and is structured as a partnership between the state, the provinces and the municipalities to ensure community-driven delivery of services. Decentralized programme management was necessary on political and technical grounds to cope with the large number of geographically dispersed and typically small projects.

Despite the overriding priority placed on delivery, the programme sought to ensure community participation and structure a constructive interface between communities, municipalities, provincial governments and central authorities. Communities submit project proposals to their municipality for approval, assistance and support. The municipality prepares business plans for the projects and submits them to the Provincial Cabinet for approval, possible additional funding and mobilization of grant funds. Funds for the project meeting the programme's criteria are channelled from the national government to the provinces. In turn, the provinces make the funds available to the municipalities and monitor project implementation.

As of March 2000, 48 per cent of MIP funds were allocated to water supply, 22 per cent to roads, 17 per cent to sanitation, 6 per cent to storm water drainage, 5 per cent to community facilities and 2 per cent to refuse collection. To promote integration and development, the programme supports the government's housing scheme by providing bulk infrastructure to new extension zones. Most recently, the MIP has been reoriented to allow for the rehabilitation of existing systems.

Impacts on the ground are impressive. Improvements to water supply systems have promoted economic activity and diminished the incidence of water-borne diseases. New and upgraded roads have fostered the development of micro-enterprises and created jobs.

Extensive community involvement is critical to successful project implementation. Communities define priorities, also develop plans and elect committees to serve as a link to municipal and provincial governments. Several have structured creative financial packages through private–public partnerships and have managed to maximize local resource mobilization. In general, willingness to pay for services increased as the quality of the services improved.

By March 2000, the programme had provided employment totalling 3.7 million person days through the use of labour-intensive construction methods and local materials. An impressive total of 272,000 person days had been devoted to training workers, thus enabling them to perform 90 per cent of construction activities. At present, a special emphasis is placed on the employment and training of women.

Lack of capacity at the local level has emerged as the single most critical constraint impeding programme performance and undermining the sustainability of achievements. The government had at first earmarked 5 per cent of MIP project funds for capacity building and training of emerging contractors and workers. This allocation has recently been increased to 10 per cent to provide adequate funding for building up local governments' technical and managerial capacity to operate services and maintain infrastructure assets.

By March 2000, South Africa's municipal infrastructure programme had implemented 1496 projects for a total expenditure of over US$350 million. MIP funds have provided water supply to 9.3 million rural and urban residents, sanitation to 5.1 million, storm water drainage to 1.7 million, access roads to 3.8 million, community lighting to 1.1 million and solid waste disposal to 0.9 million.

In 1998, MIP was recognized as a Best Practice under UNCHS/Habitat Best Practices and Local Leadership Programme.[i]

Note: i The Centre for Urban Development Studies at Harvard University undertook a detailed evaluation of the programme funded by the World Bank and UNDP, in collaboration with public officials and PDG Consultants. The Centre also provided capacity building to the programme management team at the central and provincial level, and conducted training courses on infrastructure and local development. These activities were funded by USAID and the government of South Africa.

channel targeted central transfers to both provincial and local governments based on prevailing levels of poverty and the state of the rural economy. A major effort is underway to improve living conditions, provide infrastructure to unserviced and underserviced communities, build up the capacity of smaller and weaker municipalities and provide them with technical and financial support to enable them to develop economically and socially (See Box 13.4).

Community-based financing of infrastructure projects

Recognizing the empowering role of infrastructure, shelter advocacy groups and microfinance institutions have initiated programmes to enable the poor to access the services they badly need to improve their living conditions

Recognizing the empowering role of infrastructure, shelter advocacy groups and lately microfinance institutions have initiated programmes to enable the poor to access the services they badly need to improve living conditions in both urban and rural settings.

A leader in this field is the Self-Employed Women's Association (SEWA), established in 1972 in Ahmedabad, India, as a trade union to empower low-income women working in the informal sector (which accounts for 96 per cent of employed women). SEWA has established two institutions: SEWA Bank, a cooperative bank fully owned by SEWA shareholding members, and the Mahila Housing SEWA Trust (MHT) which provides members with legal and technical assistance to improve their shelter and access infrastructure services. By the end of 1999, SEWA had a membership of 220,000 and SEWA Bank had close to 113,000 depositors and 36,000 borrowers with a working capital of just over US$6 million.

Parivartan – a city-wide Slum Networking Project initiated by the Ahmedabad Municipal Corporation (AMC) – involves SEWA, SEWA Bank and MHT. The project aims to provide families in underserviced slums with infrastructure services, including individual water supply, underground sewerage, individual toilets, solid waste disposal service, storm water drains, internal roads and paving, street lighting and landscaping. Acting respectively as financial and technical intermediaries, SEWA Bank and MHT motivate families to contribute US$48 towards an infrastructure improvement package ranging between US$333 and US$345. In addition, families are required to contribute US$2.30 towards the cost of maintenance, which will be assumed by the community. Local industry matches the family contribution with US$48 and the balance is covered by the municipality, which also provides all Parivartan participants with written documents ensuring security of land tenure for a minimum period of ten years. To help participants to meet their contribution, SEWA Bank provides loans of up to US$37 to each family. Loans can be repaid in monthly instalments of US$2.30 or as a lump sum, and carry an interest rate of 14.5 per cent. At this time, 18 slum communities are participating in the programme.

For the three settlements where infrastructure improvements have been completed, an evaluation documented an average increase of US$1.15 per day in net household earnings. Fruit and vegetable vendors are able to wash their produce at home and do not have to wait in long queues at public water points. This allows them to get to the market at 6 a.m. and spend more time selling produce. Health problems and serious illnesses, including typhoid, malaria, diarrhoea and skin disease, have been reduced by 75 per cent. In addition, the success of the project prompted members of SEWA Bank to take out a collective loan providing each household with US$575 for home improvements.[15]

Similar approaches fostering access to services by marginalized communities are being initiated in many parts of the developing world. In Guatemala, 61 per cent of inhabitants live in rural areas, the highest proportion among Latin American countries. The vast majority are indigenous groups living in poverty. Inequitable access to land and infrastructure services perpetuates this situation. It is estimated that less than 30 per cent of the rural population has access to infrastructure. INEG, the state-owned enterprise in charge of rural electrification, requires communities to form a committee, submit an application for the service, specify the contribution they are able to make towards the cost and secure a state or municipal subsidy to cover the remainder of the cost. Construction is then undertaken by a private contractor supervised by INEG. To obtain water supply, communities must additionally pay for a report on the quality of local water sources, and commit to maintaining the system. Rural communities, lacking financial resources to meet their cost-sharing obligations, political power to leverage adequate co-funding and organizational skills to manage the process, are unable to obtain services without the assistance and support of intermediary NGOs.

Genesis Empresarial was established in 1988 to improve living conditions for low-income rural communities by providing microcredit to finance community-based delivery of infrastructure. The Community Infrastructure Lending Programme (CILP) provides technical assistance and financing to help communities to obtain electrification and water supply. A government matching grant still has to be secured by the community. Genesis loans are not subsidized. Interest rates reflect the costs associated with different sources of capital. Current rates range from 21 per cent on funds from the Central American Bank for Economic Integration (BCIE) to 30 per cent on funds from commercial banks and Genesis' own funds.

By mid-1998, 8700 households in 189 communities had received loans for electric connections under the electrification programme, launched in 1993, and 1820 families in 21 communities had received loans for water connections under the water supply programme initiated in 1995. A prerequisite for participation in the programme is that at least 90 per cent of residents must agree to the provision of infrastructure. The project is then administered through groups of four to twelve families sharing similar socio-economic characteristics. Loans range from US$120 to US$450 per household.

Collective liability and submission of a documented land title held by one household in each participating group are the only conditions for eligibility. Loan amortization periods range from one to four years, according to the group's income. Repayments are monthly with an option to pay after harvests available for agricultural labourers. In 1998, the CILP repayment rate was just over 92 per cent.

Genesis provides assistance in organizing borrowers, registering the project committee, preparing the technical report and cost estimates, filing applications for matching grants, structuring affordable repayment terms, filing applications for credit, dealing with contractors and managing the group loan accounts. Despite the financial burden of technical assistance, CILP managed in 1998 to achieve a positive return on investment of 1.2 per cent.

The initiatives presented here illustrate the particularities and shared features of decentralized provision of

infrastructure services across countries and regions. The experiences of outstanding programmes and best practices highlighted in the preceding sections provide ample evidence that dynamic local leadership, sustained outreach, civic engagement, creativity and sound financial management are important ingredients of success. These ingredients allow localities to overcome constraints, ensure delivery of infrastructure services, promote sustainable local development and foster social inclusion in very challenging contexts.

Notes

1 This chapter is based on 'Decentralization and urban infrastructure management capacity', a background paper prepared by Mona Serageldin, Suzanne Kim, and Sameh Wahba, Harvard University.

2 See, for example, Asian Development Bank; Besley and Coate, 1999; Bird et al, 1995; Burki et al, 1999; Centre on Integrated Rural Development for Asian and the Pacific, and Division of Human Settlements Development of the Asian Institute of Technology, 1991; World Bank, *Decentralization and Infrastructure*; UNDP, *Draft Report on Global Workshop on UNDP/MIT Decentralized Governance Research Project*; Estache, 1995; Estache et al, 1995; Fisman et al, 2000; Fukasaku et al, 1999; Halperin, 1998; Humplick et al, 1996; Litvack et al, 1998; Manor, 1999; Mody and World Bank, 1996; Rojas, 2000; Roy and Mackintosh, 1999; Shah, 1997.

3 In 1997, OECD and other international organizations voiced concern over the potential impacts of fiscal decentralization on China's capacity to manage its macro-economy and to finance large investments in productive infrastructure.

4 For a fuller discussion of capacity building, see Chapter 14.

5 In 1997, Bauan received international recognition as a Best Practice in Urban Infrastructure Development at the Second International Expert Panel Meeting on Urban Infrastructure sponsored by the United Nations Centre for Regional Development (UNCRD) and the Urban Management Programme-Asia (UMP-ASIA). In 1998, the municipality of Bauan was also selected as a Best Practice under UNCHS (Habitat) Best Practices and Local Leadership Programme.

6 See Chapters 4 and 17 for a fuller discussion of changes in and strengthening of local government.

7 Jerez received recognition for its achievements from the OECD as one of three Best Practices under the Local Economic and Employment Development Programme (LEED).

8 See Chapter 14 for discussion of public–private partnerships, as well as broad-based partnerships including civil society partners.

9 The Center for Urban Development Studies at Harvard University provided technical assistance and training for this initiative funded by the World Bank and USAID.

10 In 1998, the Community Infrastructure Programme was recognized as one of ten Best Practices worldwide to receive an award for excellence in improving the living environment under UNCHS (Habitat) Best Practices and Local Leadership Programme.

11 In 1996, Lublin's Local Initiatives Programme received international recognition when it was selected as one of ten Best Practices worldwide to receive an award for excellence in improving the living environment under UNCHS (Habitat) Best Practices and Local Leadership Programme. The Center for Urban Development Studies at Harvard University provided Lublin with technical assistance and training funded by USAID.

12 See Chapter 14 for a discussion of local capacity building.

13 In June 2000, the Luanda Sul programme was selected as one of ten Best Practices worldwide to receive an award for excellence in improving the living environment under UNCHS (Habitat) Best Practices and Local Leadership Programme.

14 The UNCHS Global Campaign for Secure Tenure, referenced in Chapter 16, is an important initiative in recognition of this point.

15 In 1996, SEWA received international recognition when it was selected as one of ten Best Practices worldwide to receive an award for excellence in improving the living environment under UNCHS (Habitat) Best Practices and Local Leadership Programme.