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Preface

This document seeks to support the growing interest among development cooperation agencies and their partners in recipient countries in addressing urban environmental problems. It also brings together two issues that are often considered separately: how addressing urban environmental problems can:

➡ contribute to poverty reduction; and
➡ ensure that urban based demands for resources and the use of natural sinks for urban wastes are ecologically sustainable

It emphasizes how good practice in environmental management can bring about a revolution in urban services which can:

➡ greatly reduce the health burden imposed on urban populations by airborne, food borne and water-related diseases, chemical pollutants and physical hazards - and in so doing bring particular benefits to low income groups in general and to women and children in particular

➡ support more prosperous economies; and

➡ limit the disruption that urban development may bring to local eco-systems and global cycles. Well managed urban centres can combine high quality, safe and healthy living environments with relatively low levels of resource use and waste generation.

This document also draws on recent examples of "Local Agenda 21" programmes to show how improving practice in environmental management can also help reinforce participation and strengthen local democracy. But it also considers the difficulties in achieving good practice in countries with weak and ineffective city and municipal authorities. Traditionally, development cooperation agencies have funded environmental infrastructure directly, although now there is an increasing emphasis on helping to develop the capacity of local institutions to fund, build, extend and manage such infrastructure themselves.

This document includes a focus on how environmental problems impact on people's health and who is most affected and why. In the majority of developing countries, the most critical environmental problems facing much of the urban population are life-threatening or health-threatening disease causing agents or chemical pollutants in the air, water, or soil - or in the food they eat. Good environmental management can greatly reduce these health problems and contribute much towards poverty reduction.

The discussion of the different environmental problems is also structured to highlight the environmental actions that can 'prevent' the problem - for instance under heading such as water-related, food- borne and airborne diseases, chemical pollutants, physical hazards and reducing the impact of natural disasters. As Chapter 3 will discuss more fully, the

document could have been organized using conventional sectoral categories - but these do not bring out the 'environmental' dimensions of the problems and the solutions and how these often cross sectoral and jurisdictional boundaries. A sectoral view can also hide the extent to which environmental problems need coordinated actions in different sectors by different stakeholders. This document is not intended only for environmental sections of governments and donor agencies since it seeks to highlight the environmental roles and responsibilities of all sectors of government and also of civil society.

Overview of this document

The document begins with a summary, followed by the whole report's "Conclusions and implications for Development Cooperation Agencies". This is followed by the main report which provides:

➡ a discussion of how urban environmental policy is located within broader environment and development goals - including a commitment to poverty reduction and to other social and economic goals within *Shaping the 21st Century, The Habitat Agenda* and other commitments made by donors and/or recipient governments (mainly in Chapter 1);

➡ a rationale as to why donors should invest in the urban environment and how this should also complement rural development (mainly in Chapter 2);

➡ an overview of the full range of environmental problems (mainly in Chapter 3) and of approaches that can be used to address them (mainly in Chapter 4);

➡ a framework that integrates a concern for environmental management and planning in urban areas within sustainable development goals (section 3.9);

➡ examples of how donors support urban environmental improvements and the lessons learnt from their experiences (Chapter 5); and

➡ a basic reference on the urban environment with the contents list allowing users to find particular topics and an index at the end to allow users to find more specific items.

This document does not seek to specify what priorities development cooperation agencies should have, what actions they should take or what form these actions should be - but it does describe how and why these must be determined within each particular context. Urban areas and the institutional structures within them are too diverse to allow general recommendations. But this document does stress the need for development cooperation to support local processes that allow environmental actions to be shaped by the needs and priorities of citizens, especially those with inadequate incomes - and to influence the form that action takes.

1. Introduction

1.1 The two key environmental issues

For governments and donor agencies, two issues underlie most of their concerns with the urban environment:

➡ Reducing the environmental hazards that are common in urban areas - including biological pathogens or chemical pollutants in the air, water, soil or food and physical hazards (or the toll they take on human health)[1] - within a broader commitment to reducing urban poverty and to improving the quality of the urban environment in response to citizens' needs and priorities; and

➡ Reducing the damage or disruption of ecosystems and other aspects of the depletion of 'natural capital' arising from urban based production or consumption. This might also be considered in terms of reducing the transfer of environmental costs that arise from urban production or consumption to other people and other ecosystems, over the short and long term.

These two issues fit with the Brundtland Commission's insistence that sustainable development is about meeting the needs of the present without compromising the ability of future generations to meet their own needs.[2] Although a commitment to addressing urban environmental problems would be expected to include both, there are obvious potential conflicts between them. Indeed, many initiatives to reduce environmental hazards in cities can imply increased ecological disruption in their surrounds - for instance as the 'cheapest' means of disposing of solid or liquid wastes is to dump these, untreated, outside city boundaries. However, as this document stresses, good environmental practice can generally avoid or much reduce these conflicts.

1.2 The urban environment

The urban environment, the physical environment in urban areas, is a complex mix of natural elements (including air, water, land, climate, flora and fauna) and the built environment (ie. a physical environment constructed or modified for human habitation and activity encompassing buildings, infrastructure and urban open spaces).[3] Its quality is much influenced by

➡ its geographical setting;
➡ the scale and nature of human activities and structures within it;
➡ the wastes, emissions and environmental impacts that these generate; and
➡ the competence and accountability of the institutions elected, appointed or delegated to manage it.

A city's built environment also includes its aesthetic and historical heritage. The architecture, site layout and the form given to private and public open space often give visible form to important historical or contemporary values. This heritage often includes forms of buildings and designs of neighbourhoods and public spaces that respond to local climatic conditions as building designs, the materials used and the organization of public and private spaces help to moderate extreme temperatures, provide protection from rain and wind and, where needed, limit risks from extreme weather events and natural disasters.

The physical environment in urban areas is also influenced by and often intimately related to social components such as the values, behaviour, laws and traditions of the residents.[4] In recent years, more attention has been given to such aspects - for instance in the discussions of social capital.[5] The physical environment also influences human behaviour and social relations - and it can include many characteristics much valued by most of or all of the inhabitants which are not easily understood by government agencies, especially those whose policies and actions give little scope for citizen participation. These are also aspects that are less easily understood by external agencies.

It is also difficult to generalize about the environmental characteristics that are most appreciated and enjoyed by urban populations when there is often considerable diversity in opinion between people. As Chapter 4 stresses, it is perhaps best to highlight how participatory planning and management can allow the particular priorities of the inhabitants of each settlement and city to emerge rather than seek to describe how priorities differ. But clearly, participatory processes must make sure that the priorities of all inhabitants are represented - especially those of women, of children of different age groups and of any group that faces discrimination.

1.3 Environment and urban areas

When considering environmental issues, two characteristics of urban areas need stressing. The first is the dependence of their inhabitants and enterprises on natural resources - and also on natural processes for breaking down or diluting their wastes. Box 1.1 outlines the various kinds of environmental changes that generally occur within urban boundaries as urban areas develop. In major cities, central business districts, downtown areas and industrial zones might appear to have few linkages to the natural environment as human interventions have so transformed them. But these, as well as other districts, are part of a complex concentration of people and production which depend on natural resources grown or mined outside their boundaries and generally on water bodies and land sites outside their boundaries for the disposal of wastes. Cities also depend on air movement and winds to dilute or remove air pollution.

Box 1.1: Environmental changes and problems common in urban areas[6]

Hydrological changes	- Increased surface run-off and increased flood intensity and magnitude since the extension of paved surfaces can lead to serious flooding problems unless there is adequate provision for drainage and for limiting peak flows - Depletion of subsurface water which can cause serious subsidence problems and does so in many cities
Geomorphological changes	- Accelerated erosion and sediment production, especially from construction sites (with tropical rain generally with much greater erosive power) which can lead to serious flooding as sediment blocks sewers and drains - On hills, increased slope instability and failure leading to landslides or mudslides if provision not made to avoid building on unstable slopes or measures taken to reduce hazard
Climatological changes	- Generally, less radiation received, increased temperatures; this may produce heat island effect; also increased cloudiness and precipitation - changes in humidity and wind speed
Changes in vegetation	- Destruction of much of the natural vegetation; introduction of exotic species - Increase in species that benefit from open, warm and windy environments and rubbish and that can tolerate urban air pollutants
Air quality changes	- Increase in contaminants, solid particles and gaseous admixtures
Water quality changes	- Local water sources often contaminated by wastes - Waste water from domestic and industrial sources; also from surface run of

In general, the larger and wealthier the city, the greater this dependence - although also the greater the dependence on distant eco-systems rather than those immediately surrounding the city.[7] This dependence on natural resources and processes means that a consideration of any urban area's environmental problems cannot only focus on the problems within its boundaries - but must also include the environmental impacts that occur beyond them.

The second characteristic that needs stressing is the large range of environmental hazards that urban areas can concentrate. These are generally classified in three categories:

➡ biological pathogens (disease causing agents) in the air, water, soil or food and their vectors (eg insects which transmit infections from person to person or from infected animals);
➡ chemical pollutants; and
➡ physical hazards

There are also important links between the urban environment and psycho-social health problems such as depression, drug and alcohol abuse, suicide and inter–personal violence (including child and spouse mistreatment and abuse). Many psycho-social disorders are associated with poor quality housing and living environments through stressors such as noise, pollution, overcrowding, inappropriate design and inadequate infrastructure and

services. However, this is a complex subject which is not easily summarized and for which it is not easy to isolate the environmental factors from the non-environmental factors.[8]

Environmental hazards may arise from factors that are independent of human action (for instance earthquakes), influenced by human action (for instance urban development creating new possibilities for insects which transmit diseases to breed) or arise from human action (for instance the creation of hazardous chemical wastes).[9]

As will be discussed in more detail in Chapter 3, the concern is not only for the immediate impact of such hazards individually but also for instances where the impact of two or more hazards combine (for instance where one lowers human resistance to the impact of another) or where new secondary hazards are created (for instance secondary pollutants such as ozone formed by the reaction of common urban air pollutants and sunlight). There are also hazards whose current and likely future environmental impact remains uncertain but about which there are serious concerns - for instance those arising from the growing concentration in the environment of certain persistent chemicals. The likely extent of atmospheric warming in the future and the precise scale and nature of its environmental impacts are also not known, although it is increasingly recognized that such warming will bring large disruptions to most urban (and rural) settlements and to the natural resources and systems on which they depend.

The influence of environmental factors on human health can be contrasted with influences arising from urban dwellers' own human biology, "lifestyle" (ie. individual, household or societal decisions in regard to lifestyle) and the health care system. However, it is difficult to define precisely the boundary between 'environmental' and 'lifestyle' factors as individual or group choices about 'lifestyle' influence the quality and nature of the urban environment. Similarly, the quality of the urban environment is also much influenced by the quality of the health care system.[10]

1.4 Urban environmental policy within development goals

A consideration of the two environmental issues highlighted at the beginning of this Chapter has to go beyond 'urban environmental policy' for at least four reasons.

1. Many environmental problems depend on social, economic or political progress for their resolution. For instance, the more prosperous the city and the more equal the income distribution, the easier it is to raise the funding needed for environmental infrastructure. Urban authorities also need an adequate institutional and legislative base to allow them to fulfill their role in environmental management and planning. Above all, effective urban environmental policies need competent, representative, adequately resourced local authorities. Effective environmental policies require a good knowledge of local context, including a knowledge of what are the most serious problems and the local (and other) resources that are available to help address them. Many of the less successful donor-funded 'environmental projects' in urban areas have arisen because of an inadequate understanding of local context.

Effective environmental policies also need decision-making processes that respond to democratic pressures and give adequate attention to the needs and priorities of low income groups, minority groups and groups whose particular needs are often overlooked (for instance women and children). These decision making processes need to be able to make complex decisions regarding priorities where consideration is given to economic and social issues as well as environmental issues. This is particularly difficult in places where there are many environmental problems that need to be addressed and funding is limited - and where there is inadequate data about the scale and nature of most environmental problems. International donors will find it easier to address urban environmental problems where there are effective and democratic decision-making processes and planning frameworks. They can also provide support for developing effective and accountable local governance structures.

2. There are large areas of complementarity between many social, economic, political and environmental goals. For instance, many cities' **economic** success, including success in attracting new investment has been based on good provision of environmental infrastructure (such as piped water and provision for sanitation and drainage) and a good quality living environment. The fulfilment of many **social** goals, especially those related to improved health, often requires environmental interventions to ensure their fulfilment. And as will be described in more detail later, much of the innovation in urban environmental management in developing countries in recent years has been linked to **political** changes, especially decentralization and changes towards more democratic and accountable urban governments.

However, the potential conflicts between economic and environmental goals are generally most evident when seeking to develop stronger city economies without increasing the depletion of natural capital. In considering how best to address urban environmental problems, it is also useful to distinguish between environmental problems caused by urban development and environmental problems linked to growing levels of economic activities and/or consumption whose impacts tend to be most evident in urban areas. This document stresses how both need to be addressed.

3. Many interventions which address environmental problems in urban areas are not considered 'environmental' by those who initiate and manage them. Many donor-funded sectoral programmes that reduce environmental hazards such as improving provision for water, sanitation and drainage in low-income residential areas of cities or micro-finance programmes to support house improvement among low income groups are considered as 'social programmes' or as 'infrastructure' and not as environmental interventions. Health services are not classified as 'environmental' yet a well functioning primary health care system greatly reduces the health burden for many environmental hazards, especially in low income areas of cities which have inadequate provision of basic infrastructure. It does so both by reducing environmental hazards (or the risks they pose to people) and by reducing the health burden from diseases or injuries through rapid and appropriate treatment. It is sometimes forgotten that the World Health Organization's definition of primary health care includes non-medical interventions to address environmental problems, especially adequate provision for water and sanitation.

Effective action on environmental problems often requires the combined efforts of a very diverse set of actors for whom environmental improvement is not necessarily a central concern including: the many low-income households struggling to cope with difficult circumstances; water and solid waste collection utilities accustomed to a role that ends at the tap and collection site; civil servants, doctors, teachers and scientists accustomed to viewing waste and even water as relatively low status sectoral concerns; and local organizations

whose principal purpose lies elsewhere.[11]

4. Many environmental problems require changes in policies, practices and subsidies 'outside' environment agencies. In most nations and cities, there are examples of policies which have severe environmental consequences or that inhibit solutions to environmental problems. For instance, in some countries, subsidies on coal with no environmental controls on its use can make coal burning a major source of air pollution. In many countries, investments in transport in urban areas prioritize road construction over improved public transport and fail to charge motor vehicle users the full cost of their contribution to air pollution, congestion and greenhouse gas emissions.

Thus, most urban environmental problems require action from more than just the 'environmental' ministries or agencies. The most successful environmental policies are those that ensure that potential complementarities between environmental goals and social and economic goals are exploited and potential conflicts minimized. This is recognized in many documents which donor agencies and/or governments have formally endorsed - for instance, for governments, Agenda 21 at the UN Conference on Environment and Development in 1992 and The Habitat Agenda at the 2nd UN Conference on Human Settlements in 1996 and, for OECD/DAC donors, *Shaping the 21st Century.*

1.5 The institutional context within which urban cooperation is provided

The role of development cooperation in helping to address the most pressing urban environmental problems is much influenced by the capacity and orientation of urban governments and by the space that national governments allow to development cooperation agencies to work with urban authorities. There have been major changes in the institutional context for most urban authorities in developing countries over the last 15 years from decentralization, democratization and privatization. Government roles and capacities have also been changed in most countries by structural adjustment and a down-sizing of government, in response to debt repayment crises. This Section touches very briefly on these issues, as they relate to urban environmental management.

It is not possible to be very specific about the best means to address most urban environmental problems, in part because of the great differences between urban centres, in part because of the great differences between countries in terms of what government institutions are prepared or able to take on. There are also the large differences in the ways governments operate - for instance from those that are democratic, relatively accountable and transparent to those that are not.

The responsibilities of urban authorities: One obvious

characteristic of donor funded 'urban' interventions is that they are implemented within the jurisdiction of city or municipal authorities. As such, they often depend for their success on such authorities' cooperation. Although again there is great variation in the responsibilities assigned to urban authorities, most have a wide range of responsibilities which influence environmental quality. For instance, they are usually responsible for street construction and maintenance within urban areas and for traffic management - and also for refuse collection, removal and disposal, street lighting and street cleaning, and the maintenance of parks, playgrounds, sports facilities and other public spaces. They are generally responsible for developing urban plans, and for implementing the zoning and planning controls or regulations linked to these plans. They are also generally responsible for implementing building codes, which are intended to promote health and safety within the built environment and for various other regulatory tasks (including, generally, pollution control). Local authorities or local offices of higher levels of government are also generally responsible for water supply, sewage, electric power and public transit. Even where these or other services are privatized, local authorities should have a major role in ensuring quality and coverage and in controlling prices. In many countries, local governments have an important role in providing health care and police and fire protection, often in association with national or provincial level ministries or agencies.

The weakness of urban authorities: Most city and municipal authorities in the countries to which development cooperation agencies give priority lack the financial means to carry out adequately many of the environmental management tasks assigned to them.[12] Local authorities generally lack the powers and professional staff to mobilize necessary funding. Most have very limited capacities to invest in basic infrastructure without funding from higher levels of government, since virtually all their revenues are spent in recurrent expenditures or debt repayments.

Official attitudes: The possibilities for donor support are much influenced by the attitudes of municipal authorities and other government agencies to environmental interventions. For instance, in most cities, the possibilities of improving water and sanitation to low income groups is severely curtailed if government agencies refuse to allow interventions in squatter communities or settlements within illegal subdivisions - yet these illegal settlements often include 30-50 percent of the city population and most of its low-income population.[13] In contrast, there are also many successful examples of donors supporting local government initiatives to work with low income groups and their community organizations and often with local non-government organizations.

Positive developments: Despite the weakness of many local authorities, two positive developments can be mentioned:

➡ **Increased possibilities for donors to support community initiatives.** In many countries, recent years have brought increased possibilities for donors to work with city and municipal governments and also with other groups - for instance community based organizations formed by the inhabitants of specific settlements, local NGOs and international NGOs. Again caution is needed in any general statements since there are large variations between cities in the effectiveness and representative nature of community organizations and in the competence and capacity of local and international NGOs.

➡ **The return to or strengthening of democracy and decentralization**. Decentralization of some kind has been implemented in most developing countries over the last fifteen years[14] although in many cases, the underlying reasons were more to do with the crisis of the central state or the desire to cut down the role of the central state than necessarily a desire to support decentralization. Although these changes may often be more a delegation of responsibilities rather than any devolution of power and funding, this is not always the case. In some countries, these changes are backed by more fundamental reform, including constitutional changes supporting local government and democratization within national and local governments. As later Chapters will describe, many of the more innovative local agenda 21s or urban environmental action plans are in countries where local democracy has been strengthened - for instance Manizales in Colombia, Ilo in Peru and Porto Alegre in Brazil.

Privatization: Various environmental services have been privatized in many urban areas or may be privatized in the near future. The form, range and experience with privatization is too diverse to allow a short summary. There are obvious worries in regard to provision for low income groups for any service that is privatized - perhaps especially for provision for water, sanitation, solid waste collection and health care. However, there are examples of privatized utilities that have improved and extended provision more successfully than the public agencies they replaced and have been more innovative in developing new means to improve provision for low income groups. The performance of private companies in provision of environmental infrastructure and services is obviously much influenced by the capacity of public authorities to set appropriate conditions and to ensure these are fulfilled. In some countries, 'privatization' has also included increased space for community-based and NGO-based initiatives to provide and manage environmental infrastructure and services and may open up more possibilities for donor funding for this.

Cost-recovery: The last few years have brought more consensus on a divisive issue - that of cost recovery for environmental infrastructure and services. Proponents of cost recovery correctly stress the difficulties of expanding provision and of maintaining any infrastructure or service that needs continual subsidy. But those who work with low income groups point to the inconsistency of always expecting those with the lowest incomes to pay full costs for essential services. They also point to the many direct or indirect subsidies on environmental infrastructure and services that many middle and upper income groups receive. The gap between these two positions has lessened for two reasons. The first is the many examples of improved infrastructure and services for low income groups where full or close to full cost recovery was achieved - largely through innovation in keeping down unit costs and in the use of loans to allow costs to be repaid over a longer period. The second is the recognition that there are well-targeted subsidies whose costs can be covered or absorbed in cross-subsidies - for instance through water tariffs for households keeping prices down per unit volume for the quantity each household needs for health and then increasing for those with high consumption levels.

Notes and references

1 For some such hazards, it is far more effective to reduce the potential health impact than to modify the environment to reduce or remove the disease-causing agent - for instance for the diseases for which immunization is an effective protection.

2 World Commission on Environment and Development, *Our Common Future*, Oxford University Press, Oxford and New York, 1987, page 8.

3 Haughton, Graham and Colin Hunter, *Sustainable Cities*, Regional Policy and Development series, Jessica Kingsley, London, 1994 357 pages; OECD, *Urban Environmental Policies for the 1990s*, OECD, Paris, 1990.

4 Ibid.

5 See for instance Putnam, Robert D., *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton University Press, Princeton, 1993, 258 pages; Moser, Caroline O.N., *Confronting Crisis: A Summary of Household Responses to Poverty and Vulnerability in Four Poor urban Communities*, Environmentally Sustainable Development Studies and Monographs Series No. 7, The World Bank, Washington DC, 1996, 19 pages.

6 This table is based on Gupta, Avijit and Mukul G. Asher, *Environment and the Developing World: Principles, Politics and Management*, John Wiley and Sons, Chichester, 1998, 360 pages.

7 Among many authors that discuss this are Bartone, Carl, Janis Bernstein, Josef Leitmann and Jochen Eigen, *Towards Environmental Strategies for Cities; Policy Considerations for Urban Environmental Management in Developing Countries*, UNDP/UNCHS/World Bank Urban Management Program No. 18, World Bank, Washington DC, 1994, 115 pages; Haughton and Hunter 1994 (op.cit); and Satterthwaite, David, "Environmental transformations in cities as they get larger, wealthier and better managed", *The Geographic Journal* Vol. 163, No.2, July 1997, pages 216-224.

8 See, for instance, WHO, *Our Planet, Our Health*, Report of the WHO Commission on Health and Environment, World Health Organization, Geneva, 1992, 282 pages; Harpham, Trudy and Ilona Blue (editors), *Urbanization and Mental Health in Developing Countries*, Avebury, Aldershot, 1995, 266 pages; and Ekblad, Solvig, "Stressful environments and their effects on quality of life in Third World cities", *Environment and Urbanization*, Vol. 5, No. 2, October, 1993, pp. 125-134.

9 To be more specific:
• *biotic, chemical or physical conditions that exist independent of human action* - for instance climatic conditions (although these may increasingly have been influenced by human activities) and natural hazards such as earthquakes (although as Chapter 3 describes, their human impact is much influenced by the nature and extent of human action);
• *biotic, chemical or physical conditions that have been influenced by human action* - for instance as human induced environmental changes within or around cities create new possibilities for disease transmission or disease vectors;
• *conditions or hazards created by human action* - for instance the introduction of hazardous chemical wastes into the human environment or the introduction of physical hazards such as motor vehicles.

10 See Foster, Harold D., *Health, Disease and the Environment*, John Wiley and Sons, Chichester, 1992, 516 pages.

11 McGranahan, Gordon and Jacob Songsore, "Wealth, health and the urban household; weighing environmental burdens in Accra, Jakarta and Sao Paulo", *Environment*, Vol.36, No.6, July/August 1994, pp. 4-11 and 40-45.

12 UNCHS, *An Urbanizing World: Global Report on Human Settlements 1996*, Oxford University Press, Oxford and New York, 1996, 559 pages.

13 Hardoy, Jorge E. and David Satterthwaite, *Squatter Citizen: Life in the Urban Third World*, Earthscan Publications, London, 1989; UNCHS 1996, op. cit.

14 UNCHS 1996 op. cit., Dillinger, William, *Decentralization and its Implications for Urban Service Delivery*, Urban Management Programme Discussion Paper No. 16, World Bank, Washington DC, 1993.

2. Why should donors invest in the urban environment?[1]

2.1 The seven key reasons why

Some donors are reluctant to address urban environmental issues, on the assumptions that most poverty and environmental degradation is in rural areas and that improving the environment in urban areas will encourage more rural people to move there. Many also assume that urban interventions are too expensive. These assumptions should be questioned not least because a large and growing proportion of the population and of poverty in developing countries are in urban areas[2] and because the linkages between environmental problems in rural and urban areas (and potential solutions) require environmental action in both. In addition, well-managed cities and urban systems in which environmental problems have been addressed bring much improved health, especially for lower income groups and support stronger and more stable economies. There are also economies of scale in cities for addressing most environmental problems. These points are elaborated below. Later Chapters describe how effective urban interventions are not necessarily expensive.

1. A large and growing proportion of population (and poverty) is concentrated in urban areas. It is no longer true that the population of developing countries are overwhelmingly concentrated in rural areas - see Table 1. By 1998, around two fifths of their population lived in urban areas with around one sixth living in cities of one million or more inhabitants.[3] Africa, Asia and Latin America also have a large and growing proportion of the world's largest cities. The trend is towards increasingly urbanized societies in most countries. As the Brundtland Commission's report *Our Common Future* remarked, "The future will be predominantly urban and the most immediate environmental concerns of most people will be urban ones."[4]

It is not only a question of the proportion of urban dwellers but the sheer size of the urban population in developing countries - which is now more than twice the size of the urban population of Europe, North America, Australasia and Japan combined.[6] It includes most of the world's largest cities[7] and most of the world's fastest growing large cities.[8]

Some donors are reluctant to support urban projects because they believe that urban populations are already privileged in comparison to their rural counterparts. But large sections of the urban population are not privileged. Although urban areas (especially major cities) may receive above-average levels of public expenditures in water supply, sanitation, housing and health care, in most countries a large proportion of the urban population does not benefit from this expenditure. Hospitals, piped water systems and sewers may be concentrated in cities but a high proportion of city dwellers have no access to them. At least 600 million urban dwellers in developing countries live in homes of such poor quality with such inadequacies in basic services that their lives and health are constantly at risk.[9]

Table 2.1: Urbanization levels and the distribution of the world's largest 100 cities by region[4]

	Urbanization level		Number of the 100 largest cities	
	1950	1995	1950	1990
Africa	**14.7**	**34.4**	**3**	**7**
Eastern Africa	5.3	21.7	0	0
Middle Africa	4.2	33.2	0	1
Northern Africa	24.7	45.9	2	5
Southern Africa	38.2	48.1	1	0
Western Africa	10.3	36.6	0	1
Americas	**52.8**	**74.9**	**26**	**27**
Caribbean	35.4	62.4	1	0
Central America	39.8	68.0	1	3
Northern America	63.9	76.3	18	13
South America	43.2	78.0	6	11
Asia	**16.8**	**34.6**	**33**	**44**
Eastern Asia	16.7	36.9	18	21
South-central Asia	16.6	28.8	9	13
South-eastern Asia	14.8	33.7	5	8
Western Asia	26.7	66.4	1	2
Europe	**52.2**	**73.6**	**36**	**20**
Eastern Europe	39.3	70.4	7	4
Northern Europe	72.7	83.7	6	2
Southern Europe	44.2	65.1	8	6
Western Europe	67.1	80.5	15	8
Oceania	61.6	70.3	2	2

National and global estimates of poverty usually under-estimate the scale and severity of urban poverty.[10] Governments and international agencies still tend to use income-based poverty lines to estimate the proportion of people living in poverty - but the income levels set for such poverty lines are unrealistically low in relation to the cost of food, housing, transport, water, health care and other necessities in urban areas.[11] One reason why income based poverty lines are set too low for urban populations is the assumption that living costs are the same, wherever the household lives. In many countries, a single income level is set as the "poverty line" for both rural and urban households[12] - on the assumption that the costs of the basic necessities that must be paid for to avoid poverty are the same for rural and urban households. However, living costs are usually higher in urban areas than in rural areas, for example, the cost of building or renting housing, getting to and from work and paying for water. In most urban areas (especially larger ones), there are also fewer opportunities for reducing costs through some subsistence production (e.g. growing food) or through access to free resources (e.g. wood for building or for fuel).[13] The cost of basic necessities is likely to be greatest in the larger and/or more prosperous cities. The number of poor people in urban areas and the extent of their deprivation will

always be under-estimated, unless allowances are made for the substantially higher cost of basic necessities in urban areas - and among urban areas, within the larger and more prosperous cities.

If poverty is equated only with inadequate income, it also means that the environmental, social and health dimensions of poverty (and of other forms of deprivation associated with poverty) are ignored.. In most urban centres, there is a large health burden associated with poverty, as will be described in more detail below and this is intimately linked to inadequate environmental management.

2. Improved environmental management can contribute much to reducing poverty. Improved environmental management can greatly reduce the health burdens associated with poverty as summarized in Box 2.1. For large sections of the urban population within developing countries, environmental hazards are the main cause of ill-health, injury and premature death. Those facing the greatest risks and the largest health burdens tend to be the urban poor - as the homes and neighbourhoods they live in lack safe and sufficient water supplies and provision for sanitation, drainage, garbage collection and health care. The proportion of infants who die from infectious and parasitic diseases among households living in the poorest quality housing in urban (and rural) areas in developing countries is several hundred times higher than for households in Western Europe or North America; virtually all such diseases are 'environmental' in that they are transmitted by airborne, waterborne or food borne pathogens or through disease vectors such as insects or snails. Of the 12.2 million children under the age of five who die each year in the developing countries, 97 percent of these deaths would not have occurred if these children had been born and lived in the countries with the best health and social conditions.[14]

The scale of the health burden imposed on people who live in poor quality housing has also probably been underestimated. Disease or injury burdens per person from diarrhoeal diseases, accidents, tuberculosis, most respiratory infections and intestinal worms are so much higher among those living in poor quality, overcrowded housing with inadequate or no infrastructure and services. Very few studies have looked in detail at the health burden faced by those living in very poor quality housing and the economic consequences. One that did revealed the very high health burden in terms of work days lost to illness and injury and the dire economic consequences this brought in terms of increased debt and increased under nutrition for all family members.[15] Yet, most of these health burdens could have been prevented or much reduced at low cost by good environmental management.[16]

3. Environmental services in low-income settlements are usually under-provided and end up over-priced - while

higher income groups often received subsidized public services. In many low-income urban or peri-urban settlements, lack of municipal services and private sector suppliers mean that the residents pay high costs for water and housing. It is common for low income groups to pay more than 10 times the price per litre of water to private water vendors that middle and upper income groups pay for the water piped to their homes by public or private companies.[17] Many low income households can afford to pay the full costs of improved services and infrastructure, but investments do not take place because the local authorities lack the capacity to do so - or refuse to do so, because the low income households live on illegally occupied or subdivided land. The lack of credit facilities and technical advice for low income households can also make housing and infrastructure investments unnecessarily expensive for many low income groups.[18]

Even if we ignore equity, economic considerations suggest that water provision in deprived neighbourhoods merits public support (including subsidies if necessary), while excessive use in affluent areas merits public discouragement (e.g. taxes). More water for domestic consumption can bring both public benefits and public costs. The most evident public benefits accrue in the form of better public health, and apply to neighbourhoods where per capita water use is very low, and the diseases associated with inadequate or insufficient water supplies are common. The most evident public costs come in the form of water resource depletion or diversion, and apply especially to neighbourhoods where water consumption is high. Thus, if prices are to reflect the net costs of water, they should generally be lowest in poor neighbourhoods. The fact that people living in such neighbourhoods are generally considered more deserving of public assistance, serves to reinforce this conclusion. It is thus doubly unfortunate that subsidies, along with the water, tend to flow to the wealthier parts of town.

4. Urban areas provide positive economies of scale and opportunities for cost recovery in environmental interventions. By concentrating people, enterprises and their wastes - and increasingly motor vehicles - cities can be (and often are) very hazardous places to live and work. But this same concentration also brings economies of scale[19] in measures to reduce most of the environmental hazards. For instance, high densities and large population concentrations usually mean much lower costs per household and per enterprise for the provision of piped, treated water supplies, the collection of household and human wastes, and most forms of health care and education.[20] They also reduce the cost of providing emergency services - for instance fire-fighting and emergency medical services whose rapid response to acute illness or injury can greatly reduce the health burden for the people affected. With good management in public health and environmental health and with all sectors of a city's society contributing to health, cities can be among the most healthy places to live in, work and visit.[21]

Box 2.1: Examples of how environmental actions can help reduce poverty or the deprivations associated with it

ENVIRONMENTAL ACTIONS	DIRECT EFFECTS	OTHER EFFECTS
Improved provision for water and sanitation	Can bring a very large drop in health burdens from water-related infectious and parasitic diseases and some vector-borne diseases - and also in premature death (especially for infants and young children). Safe disposal of excreta from home and neighbourhood a great health bonus.	* For income earners, **less time off** work from illness or from nursing sick family members. * **Better nutrition** (eg less food lost to diarrhoea and intestinal worms). * **Less physical effort** needed in collecting water. * **Lower overall costs** for those who, prior to improved supplies, had to rely on expensive water vendors.
Less crowded, better quality housing - through supporting low income groups to build, develop or buy less crowded, better quality housing	Can bring a large drop in household accidents (often a major cause of serious injury and accidental death in poor quality, overcrowded housing) and remove the necessity for low income groups to occupy land sites at high risk from floods, landslides or other hazards. Can also help reduce indoor air pollution.	- **Lower risk** for low income groups to lose their homes and other capital assets to accidental fires or disasters - **Secure**, stimulating indoor space an enormous benefits for children's physical, mental and social development
Avoidance of hazardous land sites for settlements	Reduces number of people at risk from floods, landslides or risks from other hazardous sites. The damage or destruction of housing and other assets from, for instance, floods or landslides can be the 'shock' which pushes low income households into absolute poverty	Sites within cities that may be hazardous for settlements are often well-suited to parks or wildlife reserves
Promotion of cleaner household fuels	Reductions in respiratory and other problems through reduced indoor and outdoor air pollution	Reduced contribution of household stoves to city air pollution
Improved provision for solid waste management	Removes garbage from open sites and ditches in and around settlements. Greatly reduced risk of many animal and insect disease vectors and stops garbage blocking drains	Considerable employment opportunities in well managed solid waste collection system where recycling, reuse and reclamation are promoted - see 3.4
Support for community action to improve local environment	If well managed, lots of low-cost ways to reduce environmental hazards and improve environmental quality in informal settlements	Employment creation; minimum incomes help households avoid poverty. Can reduce sense of social exclusion
Support for more participatory plans	Low income groups with more possibilities of influencing city authorities' priorities on environmental policy and investment	Precedents set in participatory local agenda 21s and other action plans can lead to low income groups getting greater influence in other sectors
Improved public transport	Cheap, good quality public transport keeps down time and money costs for income earners of low income groups getting to and from work	Can reduce air pollution and its health impacts. Can reduce the disadvantages of living in peripheral locations and help keep down house prices

The concentration of people and production may present problems for the organization of waste collection and disposal, but these are not problems that are insuperable, especially where a priority is given to minimizing wastes and maximizing recycling. Many cities in developing countries also have long-established traditions which ensure high levels of recycling or reuse of wastes on which solid waste management systems can build (see 3.4).[22]

The concentration of industries offers the potential to reduce the unit costs of making regular checks on plant and equipment safety, as well as on occupational health and safety, pollution control and the handling and disposal of hazardous wastes.

Economies of scale also exist for reducing the impact of disasters - for instance in the per capita cost of measures to reduce risks and in measures to respond rapidly and effectively when a disaster is imminent or happens.[23] There is generally a greater capacity among city dwellers to help pay for such measures, if they are made aware of the risks and all efforts are made to keep down costs.

One final environmental advantage of cities is that they provide a greater potential for limiting the use of motor vehicles - including reducing the fossil fuels they need and the air pollution and high levels of resource consumption that their use implies. This might sound contradictory, since most of the world's largest cities have serious problems with congestion and motor-vehicle generated air pollution. But one of the reasons why cities developed was to reduce transport distances. Cities allow many more trips to be made through walking or bicycling, especially where provision for these are encouraged. They make possible a much greater use of public transport and make a high quality service more economically feasible. Thus, although cities tend to be associated with a high level of private automobile use, cities and urban systems also represent the greatest potential for allowing their inhabitants quick and cheap access to a great range of locations, without the need to use private automobiles.

5. The contribution that well managed cities and urban systems can bring to regional and national economies is often under-estimated. In general, the higher a nation's per capita income, the larger the concentration of employment and economic activities in urban areas. Well managed cities can also attract foreign investment. In addition, the complementarities between urban development and a prosperous agriculture are often forgotten - as urban consumers and enterprises provide the demand for rural produce and urban centres provide markets, schools, health care and other producer and consumer services for rural populations.

As Sida has noted in its discussion of urbanization and development cooperation, national economic development is hampered by deficient infrastructure, unreliable services, inadequate institutions, lack of planning and outdated regulations in urban areas.[24] A large part of addressing these constraints is addressing environmental problems - especially deficiencies in provision for water, sanitation, drainage, solid waste collection and pollution control. There is also a growing recognition that enterprises seeking to set up new businesses are giving a higher priority to sites in well-managed cities with good quality infrastructure and environments in comparison to poorly managed cities, even if the poorly managed cities have lower labour costs.

There is the worry among some donors that greater investment in urban areas may promote more rapid urban growth. While it is true that many cities have grown very rapidly in recent decades, for most, this is a reflection of the rate at which their economies grew; in general, it is the countries with the largest economic growth in recent decades which have also had the largest increases in urbanization levels.[25] In addition, rapid growth should not mean rapid environmental deterioration - as cities such as Porto Alegre and Curitiba in Brazil have demonstrated with their high quality environments within two of the world's fastest growing cities of the last few decades. But rapid growth needs good urban management to avoid environmental deterioration. Economic prosperity is also generally associated with falling rates of natural increase - and in most countries, natural increase is the single largest component of urban population growth.

6. Good urban environmental management can limit the transfer of environmental costs to rural areas. The demand for natural resources and other goods by urban enterprises and consumers and their disposal of wastes can have serious environmental impacts outside urban boundaries. In general, the larger and wealthier the city, the larger its 'ecological footprint'[26] which can have serious consequences in regard to the availability of agricultural land and freshwater and the integrity of local eco-systems and global cycles.

Agricultural land and other non-urbanized land: Many cities are located within their nation's most valuable agricultural land and much of their expansion is over such land. Other urban demands can also mean the loss of agricultural land and of other sites with valuable ecological functions. However, cities should also reduce the demand for land relative to population. In most countries, urban areas take up less than one percent of the national territory[27] and well-managed cities and urban systems should minimize the destruction or damage of agricultural land and/or ecologically valuable or fragile sites.

Freshwater: The rapidly growing demand for freshwater evident in many cities is often met through drawing water

from increasingly distant water sources. This often pre-empts the use of such water in agriculture and it may cause serious ecological damage in the watershed from which it is drawn The potential for reducing this conflict through good freshwater management (including local watershed management and making best use of local water resources, including waste-water reuse) is rarely tapped.

However, it is not cities that are responsible for most resource use, waste, pollution and greenhouse gas emissions - but particular commercial and industrial enterprises (or corporations) and middle and upper income groups with high consumption lifestyles. These are seen as city problems when these enterprises and income groups are concentrated in cities but environmental strategies that focus on these particular enterprises and income groups can greatly reduce the aggregate environmental impact of urban areas. Placing these activities in rural areas would not necessarily reduce their environmental impacts (although for pollution it would generally reduce the number of people affected); indeed, higher income groups living in rural or low density suburban areas tend to have higher levels of resource use and higher greenhouse gas emissions than those with comparable incomes living in cities. In many countries, a considerable (and often growing) proportion of enterprises and higher income groups live outside cities. For instance, in Brazil and Mexico, a high proportion of new industrial investment has been outside the larger, more established industrial centres over the last 20 years. This helps explain the very slow population growth rates in Sao Paulo, Rio de Janeiro and Mexico City in the last decade or more.

Within the largest cities, the concentration of population and production can make the treatment and disposal of sewage and/or other waste water problematic given the volume of such liquid wastes that need to be disposed of and the extent to which piped systems concentrate this volume in one or a few locations. But this is rarely a major problem in smaller cities and towns - where most of the world's urban population live. There are also many examples of the safe utilization of sewage for intensive crop production[28] and of partially treated wastewater for industry.[29] There are also many examples of effective sanitation systems that do not require high volumes of water, including some that require no water at all[30] (although water is always needed by households for domestic tasks and personal hygiene). The techniques for greatly reducing the use of freshwater in city homes and enterprises, including recycling or directly reusing waste waters, are well-known, where freshwater resources are scarce[31] - although it must be recalled that it is agriculture, not cities, that dominate the use of freshwater in most nations.[32] In most urban centres, good environmental management should greatly reduce the ecological impact of waste-water disposal.

In regard to solid wastes, the concentration of production and consumption in cities also means a greater range and

possibility for efficient use of resources - through the reclamation of materials from waste streams and its reuse or recycling - and for the specialist enterprises that ensure this can happen safely. By concentrating industries, cities make possible material or waste exchanges between industries. The collection of recyclable or reusable wastes from homes and businesses is generally cheaper, per person served. Cities have cheaper unit costs for many measures to promote the use of reusable containers (and cut down on disposable containers).

7. The potential that urban areas have to help meet sustainable development goals, including keeping down greenhouse gas emissions. It becomes evident from the points raised in 1 to 6 above that good environmental management in urban areas can contribute much to both environmental and development goals - and section 3.9 will discuss how urban environmental management fits within a broader sustainable development framework. But one final reason why donors should invest in the urban environment is the role of such investments in keeping down greenhouse gas emissions. The emphasis recommended above for more resource-conserving, waste-minimizing cities to keep down the transfer of costs to rural areas will also bring reduced greenhouse gas emissions. The fact that cities provide a great potential for limiting the use of motor vehicles means not only reducing chemical pollutants and physical hazards within cities but also reducing the fossil fuels they need and the high levels of resource consumption and greenhouse gas emissions that their use implies. Other measures to improve the quality of the urban environment can also help keep down greenhouse gas emissions - for instance energy conservation, tree planting and well- managed public transport. If donors and governments want to support development patterns *that keep down* greenhouse gases, well-designed and managed urban systems have a central role in its achievement. This point will be considered in more detail in Chapter 4.

The above points suggest various important justifications for greater attention by donor agencies to urban environmental issues - including greatly reducing the health burden associated with urban poverty, contributing to more robust economies and reducing the transfer of environmental costs to rural areas or into the future. Obviously, the priorities for donor support will vary greatly, depending on the context - although in most instances, it will include a priority to improved provision for water, sanitation and drainage. In most instances, it will also have to include components of institutional support for city and municipal authorities and, where needed, support direct to community organizations. This was emphasized by the official UN background report for Habitat II, the second UN Conference on Human Settlements in 1996. After describing in some detail the scale and range of environmental problems in urban areas of developing countries, this noted that:

"Most of the problems described in this Report in terms of very poor housing, lack of piped water and provision for sanitation and drainage, the lack of basic services such as health care, the serious and often rising problem of urban violence, the problems of traffic congestion and air and water pollution arise largely from a failure of government institutions to manage rapid change and to tap the knowledge, resources and capacities among the population within each city."[33]

2.2 Linking donor action on the urban environment to the targets of Shaping the 21st Century

DAC Members are, through a global development partnership effort, committed to achieving the goals of the strategy *Shaping the 21st Century: The Contribution of Development Co-operation*. Good environmental management in urban areas can help donors reach those targets. For instance, there are:

➡ Key links between improved environmental management in urban areas and reduced urban poverty (especially in regard to the environmental health burden that most low income urban dwellers currently face) - see Chapter 3.

➡ Links between improved environmental infrastructure in urban areas and reductions in mortality rates for infants and children. Improved provision for water, sanitation and drainage is one of the most effective ways to reduce infant and child mortality for the hundreds of millions of urban dwellers who currently lack adequate provision.

➡ The contribution of improved environmental infrastructure and services to gender equality. Improved provision for water, sanitation, drainage and garbage collection will bring multiple benefits to the people who currently take most responsibility for household management, child-rearing and nursing the sick - and these are overwhelmingly women and girls. Such benefits include much improved health, considerable time-saving (including that arising from less illness within the family) and less physical effort (for instance in fetching and carrying water from distant standpoints or wells).

➡ It is unlikely that national strategies for sustainable development will be effective, unless they encourage, support and are integrated with effective local agenda 21s developed for each urban area. As 3.8 and 3.9 outline, one critical aspect of urban environmental management is reducing the environmental impact of urban-based production and consumption and their wastes on people and eco-systems outside urban boundaries and on global systems.

Shaping the 21st Century also stresses qualitative goals that are as important as the quantitative goals - and these include the evolution of more stable, safe, participatory and just societies. As Chapter 3 will describe in more detail, much environmental action is to promote safer, more just societies. And as Chapter 4 will outline, most such action will have limited impact if it is not rooted in participatory processes working with democratic and accountable governments.

Two diagrams illustrate this. The first illustrates how urban environmental projects and programmes have a range of potential benefits that feed into the key 'Shaping the 21st Century' goals. The second illustrates the importance of progress both in developing 'good environmental projects' and in supporting institutional capacity within urban governments, including the creation of participatory planning and urban management frameworks.

Notes and references

1 This Chapter draws primarily on two documents: Tannerfeldt, Göran, *Towards an Urban World: Urbanization and Development Assistance,* Swedish International Development Cooperation Agency, Stockholm, 1995; and UNCHS , *An Urbanizing World: Global Report on Human Settlements 1996*, Oxford University Press, Oxford and New York, 1996, 559 pages.

2 NB Any implicit or explicit recommendations within these guidelines that governments and development cooperation agencies should give more attention to urban environmental issues should not be taken as a recommendation that less attention be given to rural environmental issues. In addition, its suggestion that too little attention has been given to addressing the environmental health burden associated with 'poverty' may have as much relevance for rural populations as for urban populations

3 UNCHS 1996, op. cit; United Nations, *World Urbanization Prospects: the 1994 Revision*, Population Division, Sales No: e.95.XIII.12 , New York, 1995, 178 pages.

4 World Commission on Environment and Development, *Our Common Future*, Oxford University Press, Oxford and New York, 1987, page 255.

5 The statistics for 1950 and 1995 were taken or derived from data in United Nations, *World Urbanization Prospects: the 1994 Revision*, Population Division, New York, 1995, adjusted, when new census data is available. The data on the world's hundred largest cities is from Satterthwaite, David, *The Scale and Nature of Urban Change in the South*, IIED, London, 1996, 29 pages.

6 United Nations 1995, op. cit.

7 This is not new - but simply a return to what historically has almost always been the case since for most of history, North Africa, Asia and Latin America have had most of the world's largest cities; see Bairoch, Paul, *Cities and Economic Development: From the Dawn of History to the Present*, Mansell, London, 1988, 574 pages.

8 Care should be taken in assuming very rapid urban growth; note should be made that many of the largest cities in developing countries are now growing relatively slowly and many of the world's fastest growing cities in this century are in North America - see Satterthwaite 1996, op. cit.

9 Cairncross, Sandy, Jorge E. Hardoy and David Satterthwaite, "The urban context" in Jorge E. Hardoy, Sandy Cairncross and David Satterthwaite (Editors), *The Poor Die Young: Housing and Health in Third World Cities*, Earthscan Publications, London, 1990; WHO, *Our Planet, Our Health*, Report of the Commission on Health and Environment, Geneva, 1992.

10 Wratten, Ellen, "Conceptualizing urban poverty", *Environment and Urbanization* Vol.7, No.1, April 1995, pp. 11-36; Satterthwaite, David, "Urban Poverty: Reconsidering its Scale and Nature", *IDS Bulletin* Vol.28, No.2, April 1997, pp. 9-23.

11 Ibid.

12 See Tabatabai, Hamid with Manal Fouad, *The Incidence of Poverty in Developing Countries; an ILO Compendium of Data*, A World Employment Programme Study International Labour Office, Geneva, 1993, 105 pages.

13 This is not meant to imply that all rural households necessarily have free access to water, wood and land for subsistence production but to suggest that it is more common for them to do so in comparison to urban dwellers

14 WHO, *The World Health Report 1995: Bridging the Gaps*, World Health Organization, Geneva, 1995, 118 pages.

15 Pryer, Jane, "When breadwinners fall ill: preliminary findings from a case study in Bangladesh", in Vulnerability: How the Poor Cope, *IDS Bulletin*, Vol. 20, No 2, April 1989, pp. 49-57.

16 ibid.

17 See for instance Table 6.4 in World Bank, *World Development Report 1988*, Oxford University Press, Oxford and New York, 1998, page 146 showing the price differential per litre between those purchasing their water from vendors and those that obtain water through a house connection.

18 Mitlin, Diana, *Reaching Low-income Groups with Housing Finance*, IIED Paper Series on Poverty Reduction in Urban Areas, IIED, London, 1996.

19 In fact, economies of agglomeration (i.e. those related to proximity) are more important than economies of scale.

20 There are important exceptions. For instance, once cities have tapped all available local freshwater resources, the costs of tapping more distant water resources can be very expensive.

21 WHO, *Creating Healthy Cities in the 21st Century*, Background Paper prepared for the Dialogue on Health in Human Settlements for Habitat II World Health Organization, Geneva, 1996, 38 pages.

22 There are also constraints - such as an increasing volume of non-biodegradable material including glass and plastic bags which makes farmers less willing to use compost produced from organic wastes

23 International Federation of Red Cross and Red Crescent Societies , *World Disasters Report 1998*, Oxford University Press, Oxford, 1998.

24 Tannerfeldt 1995, op cit.

25 UNCHS 1996, op. cit.

26 Rees, William E., "Ecological footprints and appropriated carrying capacity", *Environment and Urbanization* Vol. 4, No 2, October 1992, pp. 121-130; and Wackernagel, Mathis and William Rees, *Our Ecological Footprint: Reducing Human Impact on the Earth*, New Society Publishers, Gabriola (Canada), 1995, 176 pages.

27 UNCHS 1996, op. cit

28 Smit, Jac and Joe Nasr, "Urban agriculture for sustainable cities: using wastes and idle land and water bodies as resources", *Environment and Urbanization*, Vol. 4, No 2, October 1992; Mara, Duncan and Sandy Cairncross, *Guidelines for the Safe Use of Wastewater and Excreta in Agriculture and Aquaculture*, World Health Organization, Geneva, 1990.

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

30 Winblad, Uno and Wen Kilama, *Sanitation without Water*, Macmillan, Basingstoke, 1985, 161 pages; Pickford, John, *Low-cost Sanitation: a Survey of Practical Experience*, Intermediate Technology Publications, London, 1995, 167 pages; Esrey, Steve,

Jean Gough, Dave Rapaport, Ron Sawyer, Mayling Simpson-Hebert, Jorge Vargas and Uno Winblad (ed), *Ecological Sanitation*, Department for Natural Resources and the Environment, Sida (Swedish International Development Cooperation Agency), Stockholm, 1998, 92 pages.

31 See for instance The Water Program, *Water Efficiency: A Resource for Utility Managers*, *Community Planners and other Decision Makers*, Rocky Mountain Institute, Snowmass, 1991, 114 pages.

32 See Table 22.1, pages 330-331 in World Resources Institute, *World Resources 1990-91: a Guide to the Global Environment*, Oxford University Press, Oxford, 1990, 383 pages.

33 UNCHS 1996, op. cit

3. Understanding urban environmental issues[1]

3.1 The range of environmental problems in cities

To help understand and manage them, environmental problems can be grouped into various categories. The different ways of doing so reflect different professional disciplines or priorities. The basis for categorizing them can be:

➡ **the nature of the problem (or the hazard it presents to people)** eg biological pathogens, chemical pollutants and physical hazards, lack of access to resources (for instance freshwater) and the generation of wastes;

➡ **the context within which the environmental problems occur** eg housing, workplace, city- wide problems, city- region interactions;

➡ **the 'sector'** into which the problem falls and/or the division of institutional responsibilities for their resolution (eg solid waste management, air pollution control)

➡ (for infectious and parasitic diseases) **the biology of the disease causing agent** or based on **the media through which infection takes place** (air, food, water, soil, animals, insects or other organisms that are disease vectors or carriers).[2]

➡ the kind of pollutant, the concentration and whether it arises from point or non-point sources.
It is also important to distinguish between environmental hazards (whether from biological pathogens, chemical pollutants or physical hazards) and resource depletion.

This section looks at the range of environmental problems by the nature of the problem or the hazard it presents and by the context within which each occurs – as shown in Table 3.1. Classifying environmental problems in this way helps highlight the environmental actions that 'prevent' the problems – as can be seen by classifying water-related diseases in such categories as 'waterborne', 'water-based' and 'water-related insect vector' rather than by the biology of the disease causing agent (eg bacteria, viruses, protozoa and parasitic worms).[3] Initially, this section planned to use sectoral categories such as water and sanitation, housing, health services..... since these are the kinds of sectors that are common within the organizational structures of governments and many development cooperation agencies. But using conventional sectoral categories can mean:

➡ the environmental aspects of problems are less clear; so too are the environmental measures that can help in prevention and how these cross sectoral and jurisdictional boundaries.

➡ confusion as to what environmental problems fall into what

sector (for instance a discussion of the health impacts of air pollution would have to be divided between transport, energy, health, pollution control and shelter/the physical environment)

➡ the omission of some important environmental issues that fall outside traditional sectors – for instance occupational exposures and environmental cost-transfers both within and between cities.

➡ a tendency in a sectoral classification system to imply that environmental problems have to be resolved by the direct intervention of public agencies. A sectoral view can also hide the extent to which environmental problems need coordinated actions by different stakeholders. Combining 'the context' and 'the nature of the problem' as outlined in Table 3.1 highlights the extent to which many problems are best addressed by supporting prevention-oriented actions at household and neighbourhood level.

Perhaps the greatest disadvantage of using this focus on particular environmental problems is that it misses the scale and nature of some system-wide impacts, including ecosystem disruptions that need to be considered from the point of view of the cumulative impact of many different human activities. Often the environmental impacts of urban activities are not immediately apparent. Many are incurred far beyond the urban boundaries, as discussed in 3.8. Also, the effects of long term exposure to low levels of pollution remain poorly understood, particularly when there are potentially synergistic effects from multiple pollutants. Moreover, ecosystems initially resilient to external pressures, can suddenly deteriorate radically in response to continued pressure. Similar considerations apply to human disease ecology. Worsening sanitary conditions, for example, may initially lead to marginal increases in endemic disease, but eventually create the preconditions for large-scale epidemics. The recent cholera pandemic in Latin America is a case in point. Such crises typically spur action. In 19th century England, cholera was dubbed "the best of all sanitary reformers" because of its ability to motivate improvements. Even today, cholera and other environmentally grounded crises can motivate major improvements. It is clearly preferably, however, to avoid the crises in the first place. Also, while crises are more apparent, slow processes of degradation can be very damaging in their own right.

It is possible to generalize about the broad range of environmental problems in cities in Africa, Asia, Latin America and the Caribbean – as Table 3.1 outlines – but not about their scale and relative importance since this varies so much between different urban centres. In addition, the extent to which environmental problems affect the health of those living in or close to the city also varies greatly – from cities in which environment-related diseases and accidents are the main causes of premature death, serious illness and injury to those where they have much more limited roles.

Table 3.1: Check-list for city-related environmental problems by context and by nature of the hazard or problem

CONTEXT	NATURE OF HAZARD OR PROBLEM	SOME SPECIFIC EXAMPLES (NB The list of examples is not intended to be comprehensive)
Within house and its plot	Biological pathogens	Water-borne, water-washed (or water-scarce), airborne, food borne, vector-borne including some water-related vectors (eg Aedes mosquitoes breeding in water containers where households lack reliable piped supplied). NB insufficient quantity of water may be as serious in terms of health impact as poor water quality. Quality of provision for sanitation also very important. Overcrowding/poor ventilation aiding transmission of infectious diseases.
	Chemical pollutants	Indoor air pollution from fires, stoves or heaters. Accidental poisoning from household chemicals. Occupational exposure for home workers.
	Physical hazards	Household accidents – burns and scalds, cuts, falls.....Physical hazards from home-based economic activities. Inadequate protection from rain, extreme temperatures.....
Neigh-bourhood	Biological pathogens	Pathogens in waste water, solid waste (if not removed from the site), local water bodies. Disease vectors eg malaria spreading Anopheles mosquitoes breeding in standing water or filariasis spreading Culex mosquitoes breeding in blocked drains, latrines or septic tanks. If sanitation is inadequate, many people will defecate on open sites – so lots of faecal contamination, including contamination of the sites where children play. If drainage is also inadequate, flooding will spread faecal contamination. If a settlement is served by communal standpipes, latrines and/or solid-waste collection points, these need intensive maintenance to keep them clean and functioning well.
	Chemical pollutants	Ambient air pollution from fires, stoves….; also perhaps from burning garbage if there is no regular garbage collection service. Air and water pollution and wastes from 'cottage' industries and from motor vehicles.
	Physical hazards	Site-related hazards eg housing on slopes with risks of landslides; sites regularly flooded, sites at risk from earthquakes. Traffic hazards. Noise. Health hazards to children if open sites have wastes dumped there because of no regular service to collect household wastes.
Workplace	Biological pathogens	Overcrowding/poor ventilation aiding transmission of infectious diseases.
	Chemical pollutants	Toxic chemicals, dust......
	Physical hazards	Dangerous machinery, noise.....
City (or municipality within larger city)	Biological pathogens	Quality and extent of provision for piped water, sanitation, drainage, solid waste collection, disease control and health care at city or municipal level a critical influence on extent of the problems
	Chemical pollutants	Ambient air pollution (mostly from industry and motor vehicles; motor vehicles' role generally growing); water pollution; hazardous wastes.
	Physical hazards	Traffic hazards. Violence. 'Natural' disasters and their 'unnaturally large' impact because of inadequate attention to prevention and mitigation.
	Citizen's access to land for housing	Important influence on housing quality directly and indirectly (eg through insecure tenure discouraging households investing in improved housing and discouraging water, electricity and other utilities from serving them)
	Heat island effect and thermal inversions	Raised temperatures a health risk, especially for vulnerable groups (eg elderly, very young). Air pollutants may become trapped, increasing their concentration and the length of people's exposure to them.

City- region (or city periphery)	Resource degradation	Soil erosion from poor watershed management or land development or clearance; deforestation; water pollution; ecological damage from acid precipitation and ozone plumes; loss of biodiversity from inadequate protection of important sites
	Land or water pollution from waste dumping	Pollution of land from dumping of conventional household, industrial and commercial solid wastes and toxic/hazardous wastes. Leaching of toxic chemicals from waste dumps into water. Contaminated industrial sites. Pollution of surface water and possibly groundwater from sewage and storm/surface runoff.
	Preemption or loss of resources	Freshwater for city preempting its use for agriculture; expansion of paved area over good quality agricultural land.
Links between city and global issues	Non-renewable resource use	Fossil fuel use; use of other mineral resources; loss of biodiversity; loss of non-renewable resources in urban waste streams.
	Non-renewable sink use	Persistent chemicals in urban waste streams; greenhouse gas emissions, stratospheric ozone depleting chemicals.
	Overuse of 'finite' renewable resources	Scale of consumption that is incompatible with global limits for soil, forests, freshwater....

GOVERNANCE: The quality and extent of provision for safe, sufficient water, sanitation, drainage and health care are probably the most important influences on the severity and relative importance of serious environmental health problems – and the nature of such provision is strongly linked to the quality of governance. Effective governance is also critical for keeping down other environmental health risks – for instance traffic accidents, occupational exposures and the control of air and water pollution. The capacity for 'good governance' is obviously influenced by the relative wealth of the city,[4] although much can often be done to address the most serious environmental problems even in urban centres with low per capita incomes.

EACH CITY'S UNIQUE CHARACTERISTICS: The particular characteristics of the city's economic base, especially the scale and nature of industry and the distribution of income are also important influences on the scale and relative importance of different environmental problems, as are the city's particular physical characteristics (its size, built form and spatial configuration) and its site characteristics (including climate, topography and resource availabilities – especially for freshwater and building materials). However, for environmental problems within cities, the influence of these particular characteristics diminishes as the quality of urban governance improves.

DIFFERENCES WITHIN CITIES: The scale and relative importance of environmental problems generally vary considerably by district or neighbourhood within cities, much influenced by the differences between districts in provision for basic infrastructure and services. In many developing country cities, the differences in environmental quality between districts can be dramatic with most middle and upper income areas having an environmental quality comparable to similar areas in cities in developed countries and most low income areas lacking provision for piped water, sanitation, drainage and health care and with high levels of over-crowding and sub-standard housing. These intra-urban differentials in environmental problems can be seen in the differences between districts in morbidity or mortality rates or in the incidence of particular diseases associated with inadequate infrastructure provision.[5] The quality of urban governance is again one of the most powerful influences on the scale of such intra-urban differentials. Good governance should diminish the environmental health disadvantages of having a low income.

DIFFERENT IMPACTS BETWEEN GROUPS: There are also important differences between groups within city populations in their exposure to environmental hazards and in the severity of their health impact. For instance, infants and young children are particularly vulnerable to many environmental hazards while many groups of people have above average levels of environmental risk because of the work they do. It is common for girls and women to be at risk from particular environmental hazards, because of the work they do or the discrimination they face in terms of access to resources, income or housing. These are described in more detail in section 3.6.

THE LACK OF DATA: The fact that the scale and relative importance of environmental problems differs so much between cities and even within each city between different districts or groups within the population would present less difficulties for governments and international agencies if there was a detailed and accurate database about environmental problems in each city and who was affected and about their immediate and underlying causes. But in most cities, there is no such database. Indeed, in many cities, there is very little data about such critical aspects as the extent and quality of provision for piped water, sanitation and drainage to households. There is often little information on the extent of the main environment-related diseases and injuries and on their health impacts. What is perhaps more worrying is that in the absence of adequate data, the environmental problems that tend to get highlighted are those that are easily measured and those that affect middle and upper income groups.[6] For instance, although ambient air pollution is a serious problem in many developing country cities and one which deserves priority action, it is often far less important in terms of health impact than inadequate provision for water, sanitation, drainage and health care. But the control of ambient air pollution may receive priority over these other problems because it is more easily measured and because its impacts are not so concentrated among low income groups. However, as Chapter 4 will describe, there are many innovations in environmental planning and management which help generate the information base that governments and development cooperation agencies need to make priorities for their interventions and do so within participatory processes which also strengthen urban governance. Greater coordination and cooperation between donors can also allow data to be shared.

SOME POLICY ISSUES: These data difficulties might not be serious in and of themselves, if urban environmental management could simply be left to private initiative. But in urban areas, as elsewhere, environmental 'goods' generally fall outside the normal purvey of markets. Prices, the economic signals which help guide action, tend not to reflect environmental burdens. Those who pollute the air, land and water, or disrupt ecosystems, rarely have to pay the price, since the effects are 'external' to the market. The economic incentives to improve the environment are similarly distorted, since the benefits are often public. Why volunteer to pay to clean up the waterways, for example? If their quality improves, the benefits accrue regardless of one's own contribution.

While it is generally agreed that the private sector alone cannot address urban environmental concerns, there are numerous different approaches to engaging the other sectors of society. Historically, emphasis has been put on the public sector, on the grounds that it should represent the public interest, and take the lead in environmental management, correcting private sector failures. Public sector failures are

also common, however. Moreover, other urban actors, ranging from community based organizations and NGOs to international organizations, can and do play important roles in determining how environmental priorities are set, how responsibilities are divided, what legal devices are instituted and generally how the urban environment is managed. To be effective, the environmental management in any given city must not only be able to identify and respond to environmental priorities, but also build upon the existing political and institutional base.

Just as it is difficult to generalize about the relative importance of different urban environmental problems, so it is difficult to generalize about the institutional basis for addressing them. The relative strength, accountability and competence in different sectors and actors vary widely between cities and over time. Some public sectors are more democratic and efficient than others, and even within a city the quality of different public sector organizations can vary significantly. In some cities the voluntary sector, including NGOs and community based organizations, is strong and vibrant, in others passive and ineffective. Private sector actors may be more or less innovative and cooperative. These are issues further developed in Chapter 4.

3.2 Controlling infectious and parasitic diseases and disease vectors

Infectious and parasitic diseases are 'environmental' because they are transmitted through environmental media – air, water, soil, food – or through insect or animal vectors. Many diseases thrive when provision for water, sanitation, drainage, garbage collection and health care is inadequate or where it breaks down. As a result, cities can become among the most health-threatening of all human environments as disease-causing agents and disease vectors multiply, as the large concentration of people living in close proximity to each other increases the risk of disease transmission, and as health care systems become unable to respond rapidly and effectively.

For most development cooperation agencies interested in expanding their environmental interventions in urban areas, supporting the control of infectious and parasitic diseases and disease vectors will be a major priority. This is for two reasons. First, these are the most serious environmental problems in most urban areas in the lower income nations and for most of the low income urban population in other developing countries. Second, this matches their commitment to reducing or eliminating poverty, as described in Chapter 2. Virtually all of the 600 million or more urban dwellers in developing countries who live in shelters and neighbourhoods where their lives and health were continually threatened because of inadequate infrastructure and service provision are also those that have to subsist on below poverty-line incomes. And the

health burden they suffer and its economic consequences (in terms of work days lost and costs of treatment) is a major cause of their poverty.

It is beyond the scope of this document to summarize the great range of infectious and parasitic diseases which have serious health consequences in urban areas. But it does seek to give some idea of their scale, scope and public health impact. These diseases can be grouped in three categories, according to the environmental pathway by which infection takes place and discussed according to the extent to which environmental interventions can control them. The discussion below is divided into:

➡ water-related diseases which includes waterborne, 'water-washed' (those associated with inadequate supplies of water for washing) and water-based diseases and those spread by water-related insect vectors;

➡ food borne or food-related diseases; and

➡ airborne diseases.[7]

Water-related diseases
At any one time, close to half of the urban population in developing countries is suffering from one or more of the main diseases associated with inadequate provision for water and sanitation.[8] Improved water and sanitation can bring great benefits in terms of improved health,[9] reduced expenditures (on water vendors and on treatment from diseases) and much reduced physical effort (especially for those who have to collect and carry water from standpipes or other sources far from their shelters).

If provision for good quality water supplies and for sanitation and drainage fails to keep up with a city's expanding population, or existing systems break down, this greatly increases the health hazards. This is especially so for a range of **waterborne diseases**, mostly diarrhoeal diseases (including cholera).[10] Diarrhoeal diseases account for a high proportion of infant, child and adult illnesses – and most water-related infant and child deaths.[11] Where water supplies and provision for sanitation are inadequate for much of a city's population, waterborne diseases can remain one of the most serious health problems within city-wide averages.[12] Overcrowding and inadequate food hygiene exacerbate the risks from contaminated water and poor sanitation.[13] There are also waterborne intestinal worms which cause severe pain and threaten the nutritional status of hundreds of millions of urban dwellers but only a small proportion of those infected will die of them.[14] Various case studies in low-income settlements have shown that a high proportion of the population have debilitating intestinal worm burdens.[15]

There is also a group of diseases often referred to as **water-washed** because they are associated with a lack of water

supplies for washing. These include various skin and eye infections such as scabies and trachoma. Most waterborne diseases are also 'water-washed' as well, as their incidence is associated with inadequate water supplies as well as contaminated water. Table 3.2 emphasizes how different aspects of improved water and sanitation influence the control of different water related diseases. It also emphasizes how it is not only improved water quality that is important but also more regular and convenient supplies (so more is available to allow improved personal and domestic hygiene and food sanitation) plus provision for the disposal of excreta and waste water.

Diseases spread by **water-related insect vectors** are among the most pressing environmental problems in many cities. These include malaria. Although commonly considered a 'rural' disease, there are severe problems with malaria in urban areas in large parts of Africa, Asia and Latin America;[17] in many cities or poor peripheral city districts, malaria is one of the main causes of illness and death.[18] The *Anopheles* mosquitoes which are the vector for malaria breed in standing water, so good drainage is an important part of malaria control.

Other kinds (or *genera*) of mosquito can be the vectors for other serious diseases. The diseases spread by *Aedes* mosquitoes (which include dengue, dengue haemorrhagic fever and yellow fever) are serious health problems in many cities; pots and jars, small tanks, drums and cisterns used for storing water in houses lacking regular piped supplies can provide breeding habitats for these mosquitoes.[19] So too can small pools of clean water within residential areas in, for instance, discarded tin cans and rubber tyres.[20] Reliable, steady piped water supplies (so households do not need to store water) and good garbage collection can greatly reduce the risk of diseases spread by *Aedes* mosquitoes. *Culex* mosquitoes which can be one of the vectors for bancroftian filariasis (a debilitating disease affecting millions of people) can breed in open or cracked septic tanks, flooded pit latrines and drains but can be controlled through measures as simple as polystyrene balls in septic tanks and latrines.[21] Even where mosquitoes do not pose severe health threats, they are often a severe nuisance and low income households may spend significant proportions of their income on insecticides or repellants.

Disease vectors also have an important role in the transmission of many water-borne or water-washed diseases including diarrhoeal diseases (cockroaches, blowflies and houseflies), hepatitis A (houseflies, cockroaches), relapsing fever (body lice and soft ticks), scabies (scabies mites), trachoma (face flies) and typhus (body lice and fleas).[22] Many disease vectors thrive when there is poor drainage and inadequate provision for garbage collection, sanitation and piped water supply water.

Table 3.2: The relative importance of different interventions related to water and sanitation for the prevention or control of different diseases[16]

Disease	Water quality	Water quantity or convenience	Personal and domestic hygiene	Waste water disposal or drainage	Excreta disposal	Food sanitation
Diarrhoea						
a) Viral diarrhoea	medium	high	high	–	medium	medium
b) Bacterial diarrhoea	high	high	high	–	medium	medium
c) Protozoal diarrhoea	low	high	high	–	medium	medium
Poliomyelitis and hepatitis A	low	high	high	-	medium	medium
Worm infections						
a) Ascaris, trichuris	low	low	low	low	high	medium
b) Hookworm	low	low	low	–	high	–
c) Pinworm, dwarf tapeworm	–	high	high	–	medium	low
d) Other tapeworms	–	low	low	–	high	high
e) Schistosomiasis	low	low	–	low	high	–
f) Guinea-worm	high	–	–	–	–	–
g) Other worms with aquatic hosts	–	–	–	–	medium	high
Skin infections						
Eye infections						
Insect transmitted						
a) Malaria						
b) Urban yellow fever, dengue						
c) Bancroftian filariasis						
d) Onchocerciasis						

The degree of importance of each intervention for each particular disease is ranked as 'high', 'medium' and 'low'; a dash means that it has negligible importance.
* Vectors breed on water storage containers

Box 3.1 summarizes the extent of provision for water and sanitation. Despite the commitment made in the 1970s by governments to universal provision for water and sanitation by 1990, the number of people <u>not</u> served has increased over the last 20 years. Most cities have large sections of their population lacking adequate provision for sanitation; many major cities and most smaller urban centres have no sewers at all.[23]

Box 3.1: Provision for water and sanitation in urban areas in developing countries[24]

The proportion of urban dwellers with provision for piped water and sanitation has increased over the last 20 years but with the rapid increase in urban populations, the number of people not served by water supplies and sanitation has increased, not declined. In 1994, close to 300 million urban dwellers were still not served by water supplies and close to 600 million were without sanitation. There is also less development cooperation as many international agencies have reduced their budgets for water supply and sanitation since the end of the International Drinking Water Supply and Sanitation Decade (1981-1990).[25]

Table 3.3: Coverage of water supply and sanitation for urban areas, 1994.

Region	Urban population served by water supply		Urban population with sanitation coverage	
	Millions of inhabitants	Percent	Millions of inhabitants	Percent
Africa	153	64	131	55
Central and South America and the Caribbean	306	88	254	73
Asia and the Pacific	805	84	584	61
Western Asia	51	98	36	69
Total	1,315	82	1,005	63

The above figures also exaggerate the number of urban dwellers that are adequately served.[26] For water supply to be 'adequate', it must be of good quality, close-by and easily available. Many governments include in their official statistics of people 'adequately' served all households with public standpipes, even when dozens or even hundreds of households have to share each standpipe and fetching and carrying water from distant standpipes is a time consuming and arduous task. In addition, many public standpipes are poorly maintained or connected to water supply systems that function intermittently. Thus, tens of millions of urban dwellers judged by official statistics to have adequate water supply still face great difficulties in obtaining sufficient water for good health.

Similarly, the estimate that some 600 million urban dwellers lack provision for sanitation also understates the problem. Far more than this lack provision for sanitation that is easily accessible, that minimizes the possibility of human contact with human excreta and that is easy to maintain. Many government statistics consider all households that in theory have access to a communal pit latrine as having adequate sanitation. It is rare for such latrines to be kept clean and well maintained, when shared by dozens of households.[27]

Food borne or food-related diseases
Most diarrhoeal diseases and many other water-borne diseases (including cholera and hepatitis A) can be transmitted by food as well as water. Contaminated or undercooked food are also the cause of some of the most widespread intestinal worms such as ascariasis (roundworm), trichinosis (whipworm) and taeniasis (beef and pork tapeworm). Crowded cramped conditions, inadequate water supplies and inadequate facilities for preparing and storing food greatly exacerbate the risk of food contamination.

"...microbially contaminated food contributes to a high incidence of acute diarrhoea in Third World countries and food borne diseases including cholera, botulism, typhoid fever and parasitism ... microbial activity generally contributes to food spoilage while unsafe chemicals may deliberately be added to retard or disguise spoilage ... food contamination is intimately linked to the sanitary conditions of food preparation, processing and even production."[28]

In addition, bacterial multiplication is extremely rapid in warmer climates, making risk of contamination and spoilage all the greater.[29]

Within poor quality housing which lacks basic infrastructure, it is difficult to separate out the health impact of inadequate water, inadequate sanitation, inadequate garbage collection and inadequate facilities to safely prepare, cook and store food. There are numerous interconnections and interactions within the home among water, sanitation, flies, animal, personal hygiene and food that are responsible for diarrhoea transmission.[30]

Many environment-related diseases are significant contributors to undernutrition – including intestinal worm infections and diarrhoeal diseases. Micro-nutrient deficiencies in food supplies for particular regions are also a serious and widespread problem – for instance iodine and vitamin A deficiencies have a very large health impact each year. However, while the immediate cause of many micro-nutrient deficiencies may be environmental, these are generally best addressed by ensuring a greater intake by the population (for instance through supplying iodized salt and vitamin A capsules or promoting dietary modifications) – and the cost of doing so is generally very low.[31]

FOCUS ON POLICY 1: **The Range of Solutions For Improving Provision For Water And Sanitation**

The last 20 years have shown the many ways in which provision for water and sanitation can be improved to those inadequately served. These include not only different technologies but also innovations in institutional arrangements, installation methods and payment procedures.

The best means to improve water and sanitation within limited budgets (and often with the need to recover costs) will vary considerably from settlement to settlement because of

➡ **technical issues** related to the cost of supply (eg a settlement's distance from existing water mains, sewers and drains, topography, soil structure, settlement layout, possibilities of tapping local water resources....);

➡ **demand** (which are influenced by income levels and the priorities of the inhabitants); and

➡ **institutional issues** (for instance the nature of the inhabitants' land tenure and official attitudes to water and sanitation provision to informal settlements). The possibilities for improving provision in informal settlements with secure tenure and well established community organizations are obviously much greater than in squatter settlements with rapidly changing populations and insecure tenure. It is difficult for any water agency to provide house connections and get regular payments in settlements where it is not clear who owns what plot and where houses have no official address.

There is a growing recognition that companies or agencies responsible for water and sanitation:

➡ **need a more detailed idea of existing (formal and informal) systems and businesses that are already providing water and sanitation** to those they do not serve and of different inhabitants' own needs, priorities and willingness to pay.

➡ **need to develop a range of responses to meet the diversity of needs, priorities and willingness or capacity to pay.** For many of the lowest income settlements or within the weakest local authorities, this will often include support for community provision (the agency providing piped water and sewer or drain connections to the site and the inhabitants organizing the systems within their settlement) and community management (for instance of water points and shared sanitation and washing facilities).

➡ **need to act on sanitation and not just water supply.** In part this is because improved sanitation is also needed to reduce diarrhoeal and other water-borne diseases. The safe disposal of household's waste water (sullage) is also important because this contains some disease causing agents or when not removed, provides a breeding ground for disease-carrying insects or facilitates the development of soil-based parasitic worms such as hookworm.

➡ **can draw on a considerable range of methods for safe, good quality 'sewerless' sanitation.**[32] But where support for improved sanitation is within settlements which lack sewers, too little attention is often paid to ensuring there is an effective service to collect and dispose of excreta from bucket and pit latrines and septic tanks. Programmes to support the construction of latrines often fail to develop adequate programmes to ensure they can be regularly emptied. Households with latrines need an efficient and affordable service. Manual emptying of pit latrines is a very unpleasant and hazardous job.[33]

Below are examples of different measures which highlight how it is not only technological innovations that can improve provision and cut costs:

TECHNOLOGICAL INNOVATIONS: The table below illustrates the variation in capital costs for different sanitation options. The cost of sewers can be cut by using smaller pipes and shallower trenches, shallower gradients and interceptor tanks. Costs for 'on-site' sanitation options that do not need sewers are generally lower – for instance 'ventilated improved pit' (VIP) latrines, pour-flush toilets linked to double vaults or community septic tanks – although local conditions such as soil conditions, ease with which pits can be dug and groundwater levels affect which is most appropriate in each circumstance. Provision for sanitation must also make provision for the safe disposal of waste-water. In large and high density residential areas, unit costs for sewer systems may be comparable to 'on-site' systems and much preferred by the inhabitants because these also remove waste water and do not need emptying.

Table 3.4: Typical Range of Capital Costs of Different Sanitation Systems (1990 prices)

Type of System	US$ per household
Twin pit pour-flush latrines	75 – 150
Ventilated improved pit latrine	68 – 175
Shallow sewerage	100 – 325
Small-bore sewerage	150 – 500
Conventional septic tanks	200 – 600
Conventional sewerage	600 – 1200

NB. Capital costs alone should not be used as the only basis for determining the cost of a system since some systems are more expensive than others to operate and maintain. Pit latrines and septic tanks need services that can empty them regularly. What must be determined are the total discounted capital, operation and maintenance costs for each household. From this, it is possible to calculate the charge that would have to be levied to obtain full cost recovery – and from this, to establish whether households can afford and would be prepared to pay this amount. Many low cost sanitation alternatives are affordable even by the poorest urban communities. The convenience of off-site systems may also mean that low income households are prepared to pay more for these.

INSTITUTIONAL INNOVATIONS: Tariff structures with a low price per unit volume of water up to a certain consumption level help ensure low income groups can afford this. It is often cheaper to provide piped water to a tap at the edge of the plot rather than to the house. In settlements where it is too expensive or too difficult institutionally to provide piped water connections to each house or yard, there are a range of measures to improve provision – many of which can also recover costs. Where people rely on communal water points and water vendors, well-managed water kiosks (including those managed by community organizations) may improve service levels, reduce the distance that water has to be carried and reduce prices while also recovering costs.

Water connections to each house or plot remain the ideal because these provide health benefits that more distant sources do not. There are often ways in which water agencies can support such connections rather than providing them themselves. For settlements where the inhabitants lack the income to afford connection charges, the water agency can provide connections to water mains and trunk sewers at the settlement's boundary with the inhabitants organizing the systems within their settlements. For water agencies seeking to reach low-income households with affordable piped supplies, costs can be reduced by selling the water 'wholesale' to a community with the community collecting payments from households. For instance, using a community water meter means the agency avoids the cost of individual house meters (which are expensive to install and to get read). Comparable measures can also be used for communities that are too distant from water mains to be connected – for instance, a water agency might deliver bulk water to a large community tank with the community organization taking on the task of piping the water into each household and collecting payments.

INNOVATIONS IN INSTALLATION: The costs of installing pipes for water and/or sanitation can be reduced if households and/or community organizations are prepared to dig the ditches and ensure houses are prepared for connections. A strong focus on keeping down costs as in the NGO-supported construction of sewers in Orangi in Karachi, Pakistan, may allow good quality 'expensive' solutions to be installed for low income households with costs fully recovered.[34] For settlements to which it is expensive to extend mains water, tapping local water resources or bulk delivery to a community tank may be cheaper.

PAYMENT PROCEDURES: The difficulties that low income households face in paying connection charges for piped water or sewers can be reduced by allowing this to be paid over a number of months with the payment integrated into service charges or through providing loans.

MICRO-FINANCE: Loans available to low income households can allow them to improve provision for water and sanitation – for instance through affording connection charges or by better provision within their home (eg installing a well designed latrine) or through allowing them to buy or build a better quality home. There are many examples of successful community-based savings and loans schemes that have done this with high levels of cost recovery.[35]

Airborne diseases

Some of the world's leading causes of death – and of easily prevented death – are caused by airborne infections; for many, their transmission is aided by the overcrowding and inadequate ventilation that is so common in the housing used by lower income groups – from tenements and cheap boarding houses to one or two-room shacks. They include acute respiratory infections (especially pneumonia and bronchitis which are the single largest cause of infant and child death worldwide), tuberculosis (the single largest cause of adult death worldwide)[36] and measles (also one of the largest causes of infant death worldwide and a major cause of infant and child morbidity and mortality in poor urban areas.)[37]

However, while improving housing and other environmental conditions can reduce their incidence (and by greatly reducing other diseases also strengthen people's defences against these) medical interventions such as immunization for TB and the common childhood vaccine preventable diseases and rapid treatment for acute respiratory infections are more important for reducing or eliminating their health impact. Poorer groups are generally 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.[38]

Links between urbanization and emerging or re-emerging diseases[39]

Urbanization can also create foci for disease vectors and new ecological niches for animals which harbour a disease agent or vector. This may be the result of the expansion of built-up areas, the construction of roads, water reservoirs and drains and land clearance and deforestation[40] or, the result of increased volumes of human excreta, garbage or waste water that are not cleared away. In addition, as cities expand, it is common for low-income groups to develop settlements on land subject to flooding or on or beside wetlands, as this land has less commercial value and the inhabitants have more chance of being permitted to stay there. But this may mean close proximity to places where various insect vectors can breed and so putting their inhabitants at risk from, for instance, malaria (from *Anopheles* mosquitoes) or dengue fever or yellow fever (from *Aedes* mosquitoes).

There are also two further problems. The first is the growing number of what are usually termed "new" or "emerging" diseases, of which AIDS is the best known and one of the most widespread. These are new in the sense that they only recently became a significant public health problem but in most instances it is their incidence and geographic range that is new, as they previously existed either in nature or in isolated communities. The second is the re-emergence of well-known infectious diseases that until recently were considered under control. For instance, cholera and yellow fever are now

striking in regions that were once thought to be safe from them. Malaria and dengue fever have become among the most serious health problems in many urban centres. The incidence of tuberculosis has been increasingly rapidly over the last decade, in developing as well as developed countries. The main reason why emerging and re-emerging diseases have become such a serious problem is the low priority given by most governments and international agencies to public health and health care. But part of the reason is also the greater difficulties in preventing and controlling infectious diseases as societies urbanize and as population movements increase (including the very rapid growth in the number of people crossing international borders), and as disease-causing agents develop resistance to public health measures or adapt to changing ecological circumstances in ways that increase the risks of infection for human populations. For instance, the control of malaria has become more difficult in many places as the *Anopheles* mosquitoes can no longer be killed by many insecticides and many of the drugs used to provide immunity or to treat malaria are not longer effective.

Various species of the anophelines have also proved able to adapt to urban environments.[41] Similarly, many bacterial disease-causing agents including those that cause pneumonia, tuberculosis and typhoid fevers and some diarrhoeal diseases and forms of food poisoning have become resistant to many antibiotic drugs. Meanwhile, the development and distribution of new antibiotics cannot keep up with the speed at which many disease-causing agents develop a resistance to them, especially in the lower income countries.[42]

Constraints on action

Acting on the environmental problems noted above is not easy. It is not only a question of the weakness of city and municipal authorities. Most environmental specialists also lack a detailed knowledge of these diseases, as they are considered to fall outside their disciplinary boundaries. In addition, their control often depends on effective inter-sectoral cooperation – as solid wastes block drains, as sewage contaminates drinking water and as insects breed in wastes.[43] This combination of effective urban authorities and an institutional structure which promotes inter-sectoral cooperation are rare in most of the urban areas in which development cooperation agencies are operating or plan to operate. And while it is self-evident that environmental health and public health authorities should work together, it has often proved difficult to ensure this happens – both within city authorities and within international agencies.[44]

However, there are many examples of successful projects and programmes that have greatly improved provision for water, sanitation, drainage, garbage collection and primary health care to lower income groups while also keeping costs down to what can be afforded.[45] Most are undertaken by city and municipal authorities or national agencies or by private sector firms – although increasingly in collaboration with local NGOs

and community based organizations. There are also examples of successful projects and programmes undertaken by local NGOs and community based organizations with little or no support from government agencies – and even of these coming to influence the approaches of public or private agencies.[46]

3.3 Reducing chemical and physical hazards within the home, workplace and wider city

The scale and severity of many chemical and physical hazards increases rapidly with increasing industrial production and with the growth in road traffic. While controlling infectious and parasitic diseases or reducing city population's vulnerability to them centres on provision of infrastructure and services to entire city populations (whether through public, private, NGO or community organization provision), achieving progress in this second category is largely achieved by regulating the activities of enterprises and individuals.

Chemical pollutants

Table 3.5 lists a range of chemical pollutants that are common in urban areas which affect human health or about which there is concern, even if the precise health impact remains unknown. One of the most important areas in which to reduce the health impact of chemical pollutants is controlling occupational hazards that includes people's exposure to dangerous concentrations of chemicals and dust – along with attention to other hazards such as inadequate lighting, ventilation and space and a lack of protection from machinery and noise. Action is needed in these areas from the large factories down to small "backstreet" workshops. In many cities, there are particular industrial sectors with large numbers of informal enterprises which have serious occupational hazards. These include metal- working industries, lead-battery recycling, textile, leather and ceramic industries and enterprises collecting and using human wastes.[47]

Air Pollution

One of the most serious chemical hazards in many developing countries is indoor air pollution from smoke or fumes from open fires or inefficient stoves and inadequate attention to venting.[49] This is especially so when coal or biomass fuels are used as domestic fuels. These problems are generally concentrated among lower income households as people tend to move to cleaner, safer fuels when incomes rise. Although most of the data on indoor air pollution come from rural settings, indoor air pollution among lower income households is known to be a serious problem in particular cities – for instance, a study in Accra included the monitoring of respirable particles and carbon monoxide for 199 women and found that they were exposed to 'disturbingly high concentrations' of total suspended particulates, especially for those using wood or charcoal.[50] High levels of indoor air pollution can cause inflammation of the respiratory tract

Table 3.5: Examples of chemical pollutants within the human environment which are hazardous to human health[48]

Chemicals which can be found in food and water:
* Lead (in food, in drinking water, especially where there is a combination of lead water pipes and acidic water)
* Aflatoxins and other natural food toxicants
* Nitrates in drinking water (and their conversion into nitrites in the body)
* Trace pollutants in water supply, many from agro-chemicals (for instance various halogenated organic chemicals)
* Aluminium (food and drinking water)
* Arsenic and mercury

Chemicals commonly found in the indoor environment (home/workplace):
* Carbon monoxide (incomplete combustion of fossil fuels)
* Lead (paint – ingested by children)
* Asbestos (usually from roofing insulation or air conditioning conduits)
* Smoke from combustion of coal and wood (or other biomass fuel)
* Tobacco smoke
* Potentially dangerous chemicals used without health and safety safeguards (by home-workers and in occupational setting)
* Formaldehyde (mostly from insulation; also some wood preservatives and adhesives)

Chemicals found outdoors in urban areas in the air (ambient):
* Lead (exhausts of motor vehicles using gasoline with lead additive, from external paint, some industrial emissions)
* Sulphur dioxide, sulphates and smoke/suspended particulates (mainly from coal or heavy oil combustion by industries, power-stations and, in some cities, households)
* Oxides of nitrogen (in most cities, mostly from motor vehicle emissions; also some industries)
* Hydrocarbons (motor vehicles, petrol stations, some industries)
* Ozone (secondary pollutant formed by reaction of nitrogen dioxide and hydrocarbons in sunlight)
* Carbon monoxide (incomplete combustion of fossil fuels, mostly by motor vehicles)
* VOCs (Volatile Organic Compounds); there is a considerable range of such compounds that are, or may be, hazardous

Chemicals which may contaminate land sites:
* Cadmium and mercury compounds and other heavy metal compounds (industrial wastes)
* Dioxins, PCBs, arsenic, organochlorine pesticides (industrial wastes)

Also in both indoor and outdoor settings:
* Micro-pollutants
* Mixtures each at trace level (with possible additive effects)

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which, in turn, reduces resistance to acute respiratory infections while these infections in turn enhance susceptibility to the inflammatory effects of smoke and fumes. There are also many other health problems associated with high levels of indoor air pollution.[51]

There is also a need to control air pollution. As cities become larger, more industrialised and wealthier, so there is a growing need for more comprehensive and effective control of emissions from industries and motor vehicles. Worldwide, more than 1.5 billion urban dwellers are exposed to levels of ambient air pollution that are above the recommended maximum levels and an estimated 400,000 additional deaths each year are attributable to ambient air pollution.[52] Once problems of indoor air pollution are greatly reduced by the use of cleaner fuels and better stoves and ventilation, and occupational hazards are greatly reduced by effective enforcement of health and safety regulations, governments usually have to turn their attention to reducing ambient air pollution. If industrial pollution has been much reduced, it is usually motor vehicles that become the main source of urban air pollution. Table 3.6 lists the most common air pollutants and their effects.

Urban wastes, when inadequately or improperly managed, present many risks of chemical contamination – but this is discussed in 3.4.

Physical hazards
There is also a need to reduce to a minimum the risk from accidents within the home and its immediate surrounds. Accidents in the home are often among the most serious causes of injury and premature death. The heath impacts are particularly serious in cities where it is common for a high proportion of the population to live in accommodation with three or more persons to each room in a shelter made from temporary (and inflammable) materials and with open fires or stoves used for cooking and (where needed) heating. It is almost impossible to protect occupants (especially young children) from burns and scalds in such circumstances.

As in the control of infectious and parasitic diseases, a good primary health care system and provision for emergency services are also important so that those who are injured or accidentally poisoned can rapidly get appropriate treatment.

There are two other areas of considerable importance for reducing physical hazards. The first is for **traffic management** which minimizes the risk of motor vehicle accidents and which protects pedestrians from road vehicles. Deaths and injuries from motor vehicle accidents have become an increasingly significant component of all premature deaths and injuries in many cities developing countries, especially those where infectious and parasitic diseases and their underlying causes have been successfully addressed. The larger and wealthier cities in Asia and Latin

Table 3.6: The most common urban air pollutants and their effects on health[53]

POLLUTANT	ACTION	EFFECT
1. Traditional ('reducing') pollutants from coal/heavy oil combustion		
Smoke/suspended particulates (some contribution from diesel traffic too)	Can penetrate to lungs; some retained: possible long-term effects. May also irritate bronchi	LONDON SMOG COMPLEX *Short term effects:* sudden increases in deaths in hospital admissions and in illness among bronchitic patients. Temporary reductions in lung function (patients and some normal people)
Sulphur dioxide	Readily absorbed on inhalation: irritation of bronchi, with possibility of broncho spasm	
Sulphuric acid (mainly a secondary pollutant formed from sulphur dioxide in air)	Hygroscopic; highly irritant if impacted in upper respiratory tract. Acid absorbed on other fine particles may penetrate further to promote broncho spasm	*Long term effects:* increased frequency of respiratory infections (children). Increased prevalence of respiratory symptoms (adults and children) Higher death rates from bronchitis in polluted areas.
Polycyclic aromatic hydrocarbons (also small contribution from traffic)	Mainly absorbed on to smoke; can penetrate with it to lungs	Possible carcinogenic effects: may take some part in the higher incidence of lung cancer in urban areas
2. Photochemical ('oxidizing') pollutants from traffic or other hydrocarbon emissions		
Hydrocarbons (volatile: petrol etc.)	Non-toxic at moderate concentrations	LOS ANGELES SMOG COMPLEX *Short term effects:* primarily eye irritation. Reduced athletic performance. Possibly small changes in deaths, hospital admissions
Nitric oxide	Capable of combining with haemoglobin in blood but no apparent effect in humans	
Nitrogen dioxide and ozone (mainly secondary pollutants formed in photochemical reactions)	Neither gas is very soluble: some irritation of bronchi but can penetrate to lungs to cause oedema at high concentrations. Urban concentrations too low for such effects, but evidence of reduced resistance to infections in animals	*Longer term effects:* Increased onsets of respiratory illnesses (children), increased asthma attacks (adults). No clear indication of increased bronchitis.
Aldehydes, other partial oxidation products, peroxyacetylnitrate	Eye irritation, odour	
3. Others from traffic		
Carbon monoxide (other sources contribute – smoking an important one)	Combines with haemoglobin in blood, reducing oxygen-carrying capacity	Possible effects on central nervous system (reversible unless concentrations are very high). Some evidence of effects on perception and performance of fine tasks at moderate concentrations
Lead (some industrial sources contribute to air lead; human intake often dominated by lead in food and drink)	Taken up in blood, distributed in soft tissues and some to bone	Possible effects on central nervous system (longer time scale than in case of CO and not necessarily reversible). Indications of neuropsychological effects on children within overall environmental exposure range, but the relative contribution of traffic lead to total lead intake is often not clear.

America also have ratios of road vehicles to persons that are comparable to many developed country cities. Even where there are fewer road vehicles, road accidents are a particular problem as is shown by fact that the number of fatalities and serious injuries per road vehicle is often much higher than in developed countries.[54]

The second area in which some priority must be given is for ensuring an **adequate provision for play and recreation** for the entire city population. Clean, safe and stimulating playgrounds for children are needed most in the poorest residential areas where there is the least space within and around homes for children to play. City-wide, there is also an urgent need for a full range of measures to promote healthy and safe working practices in all forms of employment and to penalise employers who contravene them.

3.4 Managing wastes

Uncollected wastes and their environmental impact
Most of the environmental hazards arising from inadequate attention to solid waste management have been noted already. But there are important environmental considerations for governments and development cooperation agencies which are best considered by focussing on the wastes themselves and on who generates them, who is involved in their disposal and who benefits or loses from their collection, transport and disposal.

It is generally the responsibility of city or municipal agencies to ensure the great variety of waste products generated by consumers and enterprises is collected and disposed of. In part this is through providing or ensuring the provision of waste collection services (for households, enterprises, public offices and public spaces). In part it is setting and then enforcing the environmental (and other) standards that those who produce wastes and collect and dispose of wastes should meet. But most urban governments lack the technical knowledge, institutional competence and funding base to fully meet their responsibilities.

In regard to **liquid wastes**, large numbers of businesses and households are not connected to sewers or other means to safely collect, treat and dispose of their liquid wastes. The same is true for **solid wastes** since in most urban centres, 30 to 50 percent of the solid wastes generated in a city are not collected – although this percentage is over 90 percent for some cities and as low as 10 percent for others[56] (see Box 3.2 for some examples).

There are also large variations between urban centres in the volumes of solid wastes generated per person and per enterprise and in the proportion of the collected wastes that are disposed of in sanitary landfills or in other ways to limit air and water pollution. Although existing statistics show large shortfalls in solid waste collection and management, most such statistics are for the larger, more important and more prosperous cities within countries – and there may be very large numbers of smaller urban centres for which there is little or no provision for solid waste collection. Within urban

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FOCUS ON POLICY 2: **Addressing Multiple Goals in Urban Transport Management** [55]

Rapid urban growth brings with it increasing need for well-managed urban transport systems. Improving urban transport can be done in ways which show the possible synergies between economic efficiency, poverty reduction and environmental quality.

Efficient transport systems help attract new investment – while inefficient transport systems and congestion much reduce the agglomeration economies that underpin cities' economic advantages. Efficient public transport systems and control of urban sprawl should also reduce the association between increasing per capita incomes and rapidly increasing private automobile use – and thus moderate increased fuel use (and resulting greenhouse gas emissions) and motor vehicle related primary and secondary pollutants. Efficient public transport systems can also widen choices and keep down costs which bring particular benefits for low income households, especially for those who live in peripheral locations but still depend on central areas for access to income and services. Finally, well-managed transport systems help prevent traffic accidents (or help minimize their effects) and as noted above, deaths and injuries from

motor vehicle accidents have become an increasingly significant component of all premature deaths and injuries in many cities.

Cities should allow a high proportion of all trips to be made through walking or bicycling and this proportion can be increased significantly, where provision for these are encouraged, within a broader commitment to preventing urban sprawl and ensuring high quality public transport.

However, to achieve these synergies generally requires complementary actions by different levels of government and different sectors – for instance through taxes on fuels (perhaps with tax differentials to encourage the use of non-leaded petrol), controls on illegal parking and on vehicle emissions, land use planning which encourages the use of public or non motorized transport, measures to protect pedestrians and bicyclists, and well-managed public transport and provision for the repair and maintenance of transport infrastructure. This suggests that development cooperation agencies have a key role in strengthening the capacities within local and higher levels of government to organize such complementary actions, as well as supporting the actions themselves. Section 4 gives more details of different policy instruments.

Box 3.2: Examples of deficiencies in solid waste collection systems

OUAGADOUGOU: About 30 percent of the refuse generated daily is collected.[57]

DAR ES SALAAM: Just 24 percent of daily refuse is collected.[58]

KINSHASA: The collection of household waste is only undertaken in a few residential areas. In the rest of the city, household waste is put out on the road, on illegal dumps, in storm-water drains or buried on open sites.[59]

centres, it is also generally the districts with high concentrations of low income groups for which there is no collection or where collection services are most inadequate.

Two particular environmental impacts of inadequate or no solid collection services can be emphasized:

➡ **the environmental impacts within residential neighbourhoods** as wastes accumulate on open spaces, wasteland and streets which include the smells, the disease vectors and pests attracted by garbage (rats, mosquitoes, flies etc.) and the overflowing drainage channels clogged with garbage.[60] Leachate from decomposing and putrefying garbage can contaminate water sources.[61] Since the poorest areas of cities are also generally the ones worst served by provision for sanitation, the uncollected solid wastes usually include a significant proportion of faecal matter. A considerable proportion of the urban population in developing countries defecate in open spaces or place their faecal wastes in bags which are thrown into nearby drains or dumped on roadsides or vacant sites. The environmental hazards these present are obvious, especially for children playing on open sites with faecally contaminated garbage – and also for waste-pickers sorting through such garbage.[62] Flies and cockroaches feeding on such garbage can also subsequently contaminate food.[63] There are also the environmental problems caused by residents who try to reduce their own garbage problems – for instance by burning it. A study of household level environmental problems in Jakarta in 1991 found that the occurrence of respiratory diseases in children and their mothers was correlated to a problem with uncollected garbage and this may be because households with no collection services burn their garbage.[64]

➡ **the environmental impacts within the city and the wider region.** It is difficult to estimate the scale and nature of these environmental impacts since they depend not only on the volume and composition of uncollected wastes but also on where these end up – for instance in a river, an official dump, an unofficial dump (or simply on some piece of land) or burnt. One of the most serious

impacts arises from solid wastes dumped or washed into sewers and drains, clogging them, causing them to overflow and contributing to flooding. The health hazards are obviously much increased where the overflowing water is contaminated with faecal matter. In general, most uncollected solid wastes end up being washed into water bodies, adding considerably to water pollution.

The environmental impacts of wastes that are collected
There are also the environmental impacts of the waste collection systems (both formal and informal) that have to be considered:

➡ **the environmental health impact for all the people involved in the system** (from the employees of formal collection systems to all others involved in the collection, sorting and re-use or recycling of solid wastes). It is common for large numbers of people to derive part or all of their livelihood from collecting waste items that can be sold or through sorting through wastes to extract these – at the point where the wastes are disposed of or in intermediate waste collection points or at a dump.

➡ **the environmental impact arising from the disposal of the wastes.** Most solid wastes are deposited in open dumps. Many such dumps are unauthorized. This gives rise to many environmental problems including the contamination of ground and surface water, methane generation, and air pollution from uncontrolled burning. Well managed sanitary landfills can significantly reduce most of these problems, as well as reducing greenhouse gas emissions.

➡ **the environmental impacts of toxic or otherwise hazardous wastes.** Many industrial and institutional wastes are categorized as 'hazardous' or 'toxic' because of the special care needed when handling, storing, transporting and disposing of them, to ensure they are isolated from contact with humans and the natural environment. Most come from chemical industries although others such as primary and fabricated metal and petroleum industries, pulp and paper industries, transport and electrical equipment industries and leather and tanning industries also produce significant quantities of hazardous wastes.[65] Hospitals and some commercial enterprises also produce hazardous wastes.

There are many different kinds of hazardous wastes. Some are highly inflammable – as in many solvents used in the chemical industry. Some are highly reactive – and can explode or generate toxic gases when coming into contact with water or some other chemical. Some have disease-causing agents; sewage sludge or hospital wastes often contain bacteria, viruses and cysts from parasites. Some wastes are lethal poisons – for instance cyanide and arsenic and many heavy-metal compounds; many are carcinogenic (ie cancer inducing).

Existing data suggests great deficiencies in most urban centres in the systems set up to monitor the production, collection, treatment and disposal of such wastes and there are many case studies documenting how the careless disposal of such wastes resulted in many deaths or serious injuries.[66] Businesses which generate hazardous wastes have very large incentives to avoid 'good practice' or meeting official standards because of the high cost of doing so and because of the low risk of being caught out – or the minor penalty that would be levied if they were caught. Most urban centres lack an effective system to ensure that toxic or otherwise hazardous wastes are managed – including systems that monitor their generation, collection, treatment and disposal and that ensure that the environmental impacts of their treatment and disposal are kept down.

The informal waste economy
Many case studies have shown how there is a large and complex "waste economy" in cities; Box 3.3 gives some example of its scale in terms of employment.

Box 3.3: Employment and the "waste economy"

In Bangalore, over 40,000 people earn their living from waste recovery and recycling. Many other Asian cities have "extensive 'waste economies', structured through itinerant waste buyers, waste pickers, small waste shops, second hand markets, dealers, transporters and a range of recycling industries."[67] In Calcutta, around 40,000 people make a living from waste picking and many thousands more from farming or fishing that are based on the solid (composted) or liquid wastes from the city.[68] In Bogota (Colombia), between 30,000 and 50,000 people have the reclamation and recycling of waste as their principal income-earning activity.[69] Since most such activities take place outside formal collection systems, it is difficult to obtain reliable estimates of the proportion of wastes that are recycled.

The reclamation and re-use of materials may be so intensive that it greatly reduces the volume of solid wastes that need to be disposed of. For instance, in Bangalore, one of India's largest and most prosperous cities (with more than 4 million inhabitants within the municipality), the municipal corporation only has to dispose of around 335 tonnes of solid wastes a day because around 2,700 tonnes are recycled or reused.[70] Thus, the annual average solid waste generation per person in Bangalore may be around 270 kg but the amount that is unused and has to be disposed of is around 30 kg.

Some important policy issues
In most of the countries in which development cooperation is concentrated, there is an urgent need to improve the collection and management of solid wastes in most urban centres. But this needs to be done with a careful consideration of how this fits within the wider range of other environmental problems that also need attention. Within 'waste management', it also has to carefully consider how to build on existing (formal and informal) systems and on how to balance cost effectiveness with effective reductions in environmental impacts and positive social impacts, both for the populations inadequately served and for the populations whose livelihoods are within the formal or informal solid waste system. Extensive consultation with local actors is essential, given that the best possibilities for improvement will be much influenced by local factors. Such consultation also allows the complex trade-offs that will have to be made to be worked through by all stakeholders. Choices will have to be made – for instance perhaps whether to prioritize increased coverage or increased recycling or improved dump management.

The needs and priorities of low income communities and of waste pickers should influence such decisions; middle and upper income group pressures often promote priorities which ignore or are detrimental to these needs and priorities. But there are examples of official programmes to improve solid waste collection which incorporated waste pickers[71] or which were based on supporting micro- enterprises; also of waste recycling and reclamation programmes which provided safer and more secure employment for former waste pickers.[72] Support for the informal waste economy can contribute to waste reduction and employment creation. It is also important for development cooperation agencies to recognize the risks inherent in assuming that systems used in developed countries will be appropriate, including the use of imported technology – as in waste collection vehicles that are ill-suited to collecting from much of the city (as they cannot fit down narrow roads or lanes or reach settlements lacking paved roads) and that are difficult to maintain (many city authorities have substantial proportions of their solid waste collection vehicles not working because of a lack of spare parts or the difficulty in repairing them). Increasing reliance on large compactor collection trucks also reduce the possibilities of material reclamation and recycling, unless provision is also made for separate collection of re-usable or recyclable materials. Many imported composting or incineration plants have also failed to work, because they were not designed to operate with the volume and composition of waste evident in the cities into which they were imported.

3.5 Reducing the impact of natural and human induced disasters in urban areas[73]

The distinction between disasters and other environmental hazards
Disasters are considered to be exceptional or unusual events which suddenly result in large numbers of people killed or injured or large economic losses – and as such, are distinguished from the environmental hazards discussed

above that are common or constant. This is a useful distinction – but it has its limitations. For instance, far more urban dwellers die of easily prevented illnesses arising from environmental hazards in their food, water or air than from 'disasters', yet the death toll from disasters often gets greater attention from the media. If 1,000 people are killed by a flood, earthquake or industrial explosion in a large city, such a disaster is reported around the world. The fact that 1,000 people die each year in that same city from traffic accidents or (as in many cities) 10,000 children die each year from diseases or injuries that are easily prevented or cured or even (as in some cities) 1,000 or more people are murdered each year is not considered a disaster. The same is true for illness and injury. While disasters can critically injure thousands of people, over time, their contribution to all illness and injury is usually relatively small. This is why it is becoming more common to integrate an understanding of risk from disasters (and who is most vulnerable) with risk from other hazards, especially environmental hazards.

The principal kinds of disasters in urban areas
The disasters most commonly associated with urban areas are cyclones/hurricanes, earthquakes, floods, landslides and industrial accidents. Droughts and famines and fires and epidemics are often not listed among urban disasters, perhaps because a high proportion of the deaths they cause are on too small a scale to be considered 'disasters'. More details of each of these are given below. Note should be made that in recent decades, wars/civil strife have killed far more people than all these and other 'natural' disasters put together in many nations.[74]

DROUGHT/FAMINE: Urban populations should be less vulnerable to drought/famine than rural populations whose livelihoods and assets are depleted or destroyed by drought. But many famines arise because poorer groups cannot afford to purchase sufficient food rather than from a shortage of food. Falling food supplies and rising prices put low income urban families at risk. Hundreds of millions of urban dwellers have insufficient food intakes outside of any 'disaster' – and as noted earlier, with their nutritional status so often also compromised by diseases such as diarrhoea and large intestinal worm burdens and/or by micro-nutrient deficiencies.

CYCLONES/HIGH WINDS/STORMS: These have probably caused more deaths in urban areas than other 'natural' disasters in recent decades. It is not only the high winds that are hazardous but the heavy rainfall (which in turn may cause flooding, landslides and mudflows) and the storm-surge flooding in low-lying coastal areas that they often bring. The urban areas most at risk are heavily concentrated in coastal areas of the tropics, where there are many cities and hundreds of smaller urban centres. The small island states in the Pacific and Indian oceans and the Caribbean are particularly at risk. A combination of disaster-preparedness (including specially strengthened homes or public buildings

where people can shelter during the event), advance warning and good emergency response can greatly cut the number of persons killed or injured.

EARTHQUAKES: Earthquakes have caused many of the biggest urban disasters since many large and dense cities lie on earthquake belts. Collapsed buildings and infrastructure are the main causes of death, injury and damages, although secondary effects including fires and landslides can also be serious. Unlike cyclones and floods, earthquakes are difficult to predict. Keeping down fatalities and injuries is largely through a combination of adopting earthquake resistant designs in all buildings and in roads, bridges and dams, avoiding the use of the most hazardous sites and having well-prepared emergency services.

FLOODS: Most floods arise from natural causes – heavy rainfall or snowmelt, exceptionally tides and storm surges.[75] Most of the deaths, injuries and loss of property they cause in urban areas are human- induced, both because protective measures were not taken and from inaction in flood warning, flood preparation and post-disaster response. In cities where flooding is common, it is generally low income households who are most affected as they have settled on flood plains, river banks or other areas most at risk. Flood disasters affect many more people than cyclones and earthquakes but kill fewer people. But large numbers of flood-related deaths in urban areas may go unrecorded or are not classified as 'disasters' because most occur within illegal or informal settlements. It may have become so common for 'a few people' to die from floods in these settlements that these deaths are never included in disaster statistics – although in aggregate, around the world, there is a large annual total of deaths from 'non-disaster' floods.

LANDSLIDES: Landslides can take the form of mudflows, rockfalls or avalanches. They are often triggered by storms, water-logged soils and heavy construction but also by earthquakes and volcanic eruptions. Many major cities and thousands of smaller urban centres have high concentrations people living on or below steep slopes and cliffs. Most are low income households with limited possibilities of finding land for housing elsewhere and limited means to make their shelters safer. Official statistics suggest that landslides cause far fewer deaths and injuries than floods, cyclones and earthquakes but as with floods, this may because of under-counting as deaths from landslides become so common they are not considered as disasters.

FIRES: Historically, many of the greatest urban disasters have been caused by fires, although with modern materials and urban designs and fire-fighting responses, this is no longer the case. Measures to limit the risk of large-scale fires were also among the first examples of 'disaster prevention.' Some large scale fires arise from other disasters – for instance the fires from ruptured gas pipes in the 1995 Kobe earthquake. However, there are far more deaths and injuries from

accidental fires in urban areas that are too small to be considered 'disasters.' People living in informal settlements with high population densities, homes built mainly of flammable building materials, widespread use of open fires or kerosene stoves and lamps (or candles) are particularly at risk. The risk is much exacerbated by the lack of fire-fighting services and of rapid treatment for those who are burnt or scalded.

EPIDEMICS: Historically, the impact of epidemics has probably been greater than all other disasters, but modern control measures have greatly reduced their impact. However, there are still serious epidemics -as in the outbreak of a new strain of cholera in Bangladesh in 1993 which accounted for over 1,400 deaths and the cholera epidemic in Peru which began in 1991 and which caused at least 2,600 deaths. Although the health impact of epidemics has been much reduced, as described already, less progress has been made on reducing the impact of ''non-disaster' (endemic) infectious and parasitic diseases. As with accidental fires and probably floods, the number of deaths from 'non-disaster' diseases that can be easily prevented or cured far exceeds the number of deaths from epidemics. However, epidemics often occur after a period of deteriorating conditions or lax management (for instance of water sources) and should serve as signals of deeper problems. They can also serve to mobilize action – as in the greater attention given to water and sanitation in many Latin American cities to combat the spread of cholera and the actions taken in Surat (India) after the outbreak of plague there.

INDUSTRIAL ACCIDENTS: These include chemical and nuclear accidents, industrial explosions and the spillage of toxic or otherwise hazardous chemicals. The fact that industries and thermal power stations are usually located in cities greatly increases the number of people at risk. Over 3,000 people died in Bhopal after an industrial accident in 1984 released methyl iso-cyanate; 100,000 or more were also seriously injured.[76] The risk of industrial disasters is obviously increased if governments fail to ensure compliance with environmental and occupational health and safety regulations.

OTHERS: Volcanic eruptions and tsunamis (sea waves generally caused by earthquakes or volcanic events under or out to sea) are among the other most prominent causes of disasters in urban areas. Some volcanic eruptions take a heavy toll – as in the volcanic eruption and mudflow in Amero (Colombia) in 1985 that killed most of the town's 25,000 inhabitants. The disaster in Amero is also a reminder of how many of the worst urban disasters affect smaller urban centres whose governments are often less able to take the measures needed to reduce risks.

THE POSSIBLE INFLUENCE OF CLIMATE CHANGE: Global warming will increase the frequency and severity of many potential natural disasters in urban areas. For instance, the threat of flooding will be particularly serious for many port cities from the rise in sea level and the increased frequency and severity of storms. Rising sea levels and increased scale and frequency of floods will also bring disruptions to sewers and drains and may undermine buildings and increase the risk of seawater intrusion into freshwater aquifers. Changes in rainfall regimes may reduce the availability of freshwater resources or bring increased risk of floods and landslides.

Integrating an understanding of risk from disasters with risk from other environmental hazards
'Natural' disasters are often distinguished from 'human-induced' disasters. But for cities, most of the deaths and injuries from 'natural disasters' are not 'natural' in that they occur because of inadequate attention to disaster-prevention, disaster-mitigation and disaster-preparedness. Or to put it another way, most 'natural disasters' would not be disasters if people and institutions were prepared for them. If 300 children die in an earthquake as their school collapses on top of them, it is not 'natural' if it was caused by the failure of the school authorities to strengthen the school building. Virtually all of the deaths and injuries each year in urban areas from floods, landslides and fires and most of the deaths and injuries from earthquakes and tropical cyclones could and should be prevented. So too should the deaths and injuries from industrial accidents. There are also many instances of 'natural' disasters contributing to 'human-induced' disasters – as in the fires that often occur after 'natural disasters' or chemical contamination as tanks holding industrial chemicals or wastes are ruptured. Increasingly, urban authorities recognize the need to integrate 'disaster-prevention' within 'environmental hazard prevention'.

The difference between disasters and other environmental hazards also becomes less clear when these other hazards are particularly serious. As noted above, in urban areas in developing countries, accidental fires, landslides and floods that are too small-scale to be considered disasters and 'endemic' diseases and under nutrition that are not considered 'epidemics' or 'famines' underlie far more premature death, injury and serious illness than 'disasters'. In addition, pollution levels may fluctuate between 'disaster' and 'non-disaster'. Air pollution levels vary according to the season and/or weather conditions and in many cities, they can become so bad for particular periods that they are declared 'a disaster' with special measures taken to reduce them (for instance requiring certain industries to close down and placing controls of private automobile use). Without effective air pollution control, the intensity and frequency of such 'disasters' can increase and what was originally an occasional 'disaster' level for air pollution may become sustained for long periods. The air pollution produced by forest fires in Southeast Asia during 1997 were a disaster affecting tens of millions of people, including the inhabitants of cities far from the fires – but this is not a new problem. What made it a 'disaster' in 1997 was its scale and severity.

Integrating an understanding of disasters within other environmental hazards also shows the extent to which human

intervention can greatly reduce risks. Many disasters have natural triggers that cannot be prevented but their impact can generally be greatly reduced by understanding who within the city population is vulnerable to such disasters and acting to reduce this vulnerability, before the disaster occurs.

There are also important overlaps between 'the culture of prevention' for everyday hazards and for disasters. For instance, a city with a good sewage, drainage and garbage collection system is also a city much better able to reduce the risk of flooding. Good quality housing greatly reduces risks from physical hazards and with appropriate building and settlement design also reduces risks in the event of earthquakes, floods or cyclones. Good emergency services for accidents and acute illnesses can also serve as the basis for rapid and effective emergency responses when disasters occur.

3.6 Vulnerability

Who is most affected by environmental hazards
The presence of an environmental hazard (for instance a pathogen, pollutant, physical hazard or psycho social stressor such as high noise levels) does not necessarily mean that it will harm someone. This depends on characteristics of the individual, household and social group exposed to the hazard. Certain individual or group characteristics can also influence the severity of the health impact.

Characteristics which influence whether ill-health or injury can be avoided, and/or the severity of the health impact include:

➡ **for biological pathogens**, weak body defence (some a function of age and of nutritional status, some a function of acquired immunity);

➡ **for physical hazards**, limited mobility, strength and balance (e.g. children, older groups and people with physical disabilities facing greater risks of injury in unsafe houses built on slopes, flood plains or otherwise dangerous sites);

➡ **for exposure to chemicals**: age, activity (when exposed) and health status at the time of exposure. Certain groups are particularly susceptible to certain pollutants; for instance asthmatics are more sensitive to certain common urban air pollutants. Genetic factors may influence sensitivity to some chemicals;

➡ **social roles** that increase duration and/or severity of exposure to environmental hazards.

Factors that influence how easily the individual, household or social group can cope with environmentally induced illness or injury include:

➡ the extent of public, private and community provision for health care, including emergency response to accidental injuries or acute diseases;

➡ the individual's or household's ability to afford health care and emergency response, to purchase medicines, and take time off to recuperate when sick or injured;

➡ individual, household or community coping mechanisms once the hazard has caused sickness or injury; for instance, knowing what to do, who to visit and how to rearrange individual/household survival strategies.[77]

The people who are most vulnerable to environmental hazards are those least able to avoid them and/or least able to cope with the illness or injury they cause. Once one begins to examine what causes people's vulnerability to environmental hazards, the interaction between environmental hazards and social, economic, political and demographic factors becomes much clearer. "Health outcomes are not only influenced by environmental conditions but also by the inputs of health services, by the characteristics of the population and by the socio-economic conditions in which people live."[78] Virtually all environmental health problems in urban areas have a social, economic or political underpinning in that it is social, economic or political factors which determine who is most at risk and who cannot obtain the needed treatment and support, when illness or injury occurs.[79] To give but one example, the high incidence of diseases associated with contaminated food and water in most poor urban communities is an environmental problem in that the disease-causing agents infect humans through water or food they ingest – but this high incidence can also be judged to be a political problem since nearly all governments and aid agencies have the capacity to greatly reduce current levels of morbidity and mortality by improved provision of water, sanitation and drainage.[80] This makes it difficult to isolate the impact of environmental factors on health as distinct from other factors.

The economic underpinning of environmental hazards also becomes evident when comparing the hazards faced by low-income groups with those faced by middle and upper income groups. Studies on the incidence of infectious and parasitic diseases show that the most vulnerable group are predominantly the poor – be they children, adults in crowded, unhygienic conditions or workers in particular occupations.[81] Low-income groups are the least able to afford the homes that protect against environmental hazards e.g. good quality housing in neighbourhoods with piped water and adequate provision for sanitation, garbage collection, paved roads and drains.[82] In addition, higher-income groups will generally have less dangerous jobs and work in occupations where occupational hazards are minimized.

Low-income households are also more vulnerable because they lack the buffers to cope with illness or injury.[83] Low-

income individuals/households generally have most difficulty in getting treatment for any injury or illness – for instance emergency services in the case of a serious accident and treatment from a health centre or hospital.[84] They have the least means to afford medicines and (generally) the least possibility of taking time off to allow recovery because the loss of income from doing so would press heavily on their survival, and because they are unable to afford health insurance – or obtain the jobs for which health insurance is paid by the firm.

The environmental hazards evident within the homes and neighbourhoods of poorer groups are in effect a combination of three factors: of low-incomes; of the refusal or inability of government to intervene to guarantee poorer groups access to shelters that are not so dangerous or to the resources that allow them to build these themselves; and the refusal or inability of government to provide the community based health care and emergency services which can do so much to prevent illness or injury and to limit its impact. Ironically, it is the sites with dangerous environments that often serve poorer groups well because these are the only sites, well-located with regard to income-earning opportunities, on which they have some possibility of living (illegally) because the environmental hazards make the sites unattractive to other potential users.

Among those with low incomes, there will be considerable differentiation in the scale and nature of environmental hazards to which they are exposed and in the severity of the illness or injury to which these hazards contribute. Health indicators for particular poor districts are generally averages which can obscure the more serious health problems suffered by the poorer groups within that district. For instance, a study in a low income settlement in Kulna (Bangladesh) showed the sharp differentials in work days lost to illness or injury among the inhabitants when comparing the wealthier households to the poorer households. It also shows how in the poorer households, such illness or injury often means growing indebtedness and under nutrition for all family members.[85]

Vulnerability to disasters in urban areas
The growing interest in achieving a better understanding who is vulnerable to environmental hazards in urban areas is also evident among those concerned with disasters.[86] This is spurred by the fact that the death toll from disasters of a comparable type and scale can vary enormously from place to place. Analyses of vulnerability also make clear how much it is linked to income level (and who among low income groups or other groups are particularly vulnerable) and how much vulnerability can be reduced by competent and effective urban authorities.

Drawing on the framework described above for identifying what causes vulnerability and applying it to disasters, people can be vulnerable in at least four different aspects:

➡ **living or working in places at risk from disasters in terms of the site** (e.g. land sites more at risk from flooding, landslides or earthquakes), buildings (e.g. buildings not designed to withstand floods or earthquakes) and infrastructure (eg lack of storm drains to rapidly channel floodwater away);

➡ **being more affected by the hazard** (eg children or older people less able to move to safer sites when a flood, fire, landslide or earthquake happens);

➡ **being more affected by the lack of rapid response to the disaster** (e.g. slow or ineffective emergency services); and

➡ **being less able to cope with the consequences** (e.g. losing all capital assets or sources of income or unable to afford needed medical treatment).

These distinctions are important in at least two senses. The first is that they make clear why it is generally low income households who are most affected by disasters. In most urban areas, it is low-income groups that are heavily concentrated in the sites most at risk from disasters – flood plains, steep slopes, heavy industry sites, and sites most at risk from earthquakes. A high proportion of poor groups live in shacks made of flammable material, with higher risks of accidents. And it is in the poorer districts where infrastructure and service provision is most inadequate. Low income groups also have the least resources on which to call, when some disaster damages or destroys their housing. Their needs and priorities are also generally least served by post-disaster action. Those whose homes have been destroyed lose their most valuable asset. Many also lose their livelihood as the equipment and materials they used for their livelihoods were stored in their homes. Many lose their jobs because they are relocated, usually under the direction of some public or international agency, to a place too distant from where they previously worked. And their relocation often means losing close contact with their social networks (family, friends and contacts important to finding paid work).

The second reason is that they make clear the different ways in which vulnerability can be reduced. For instance, for the inhabitants of a settlement at risk from flooding, their vulnerability may be reduced by:

➡ reducing the risk of flooding (which may be achieved 'upstream' through better watershed management)

➡ Offering them a safer site and help in moving there (although hazardous sites often serve the poor's needs well in all other aspects so it may be difficult to find a less hazardous site that will serve their needs)

➡ Helping make their homes and neighbourhood better able to cope with floods (eg structural modifications to buildings, improved storm and surface drains)

➡ Developing an effective early warning system to warn when floods are likely

➡ Ensuring emergency services are ready to respond rapidly in the event of a flood.

➡ Having in place the supports the inhabitants need to cope with their losses, after the flood.

Groups within the population who face particular risks
The discussion above has highlighted how and why poorer groups face higher levels of risk from most environmental hazards (including those related to natural disasters). It has also become evident that 'good governance' should greatly reduce the disparities in risk between richer and poorer groups; in a city with good quality infrastructure and services and disaster preparedness, the disparities in risks between rich and poor groups is much diminished and may be eliminated.

Analyses of vulnerability to environmental hazards have to consider other factors. For instance, there are particular groups that face greater environmental risks because of their work and because of the ineffectiveness of government provision to promote occupational health and safety. There are also particularly dangerous settlements – such as those most at risk from disasters as noted above – and particular groups who face most difficulty getting access to water and washing and bathing facilities – such as pavement dwellers or those who sleep in open spaces, parks and graveyards. There is also the differentiation within low-income groups caused by demographic, health or social characteristics. This is illustrated by the sections below which look in more detail at the vulnerability of infants and children and the particular problems faced by women. However, an interest in establishing who is most vulnerable to or most affected by environmental problems in any city would also have to consider the particular problems of other groups – for instance the elderly, those with physical disabilities, and those population groups which face discrimination in obtaining access to environmental services (for instance particular ethnic groups or immigrant groups).

Infants and Children
Children are particularly at risk from many environmental hazards, compared to most other age groups, from the time of their conception through their development in the womb, their birth, infancy and early and late childhood. Age-related risk factors include weak body defences, susceptibility to particular chemicals and, for younger children in particular, inadequate or no understanding of how to avoid hazards. In a city with a well-managed environment, less than one in a

hundred children dies before the age of five and very few such deaths are the result of environmental factors; in a city with inadequate environmental infrastructure and management, between one child in four and one child in ten dies before the age of five and environmental hazards are the main causes or contributory factors in most such deaths. Similarly, in a well managed city, the differences in child mortality rates between the lowest income areas of the city and higher income areas is not very large; in a badly managed city it can vary by a factor of 10 or even 20 or more.[87]

Even in the relatively sheltered environment of their mother's womb, the developing embryo is strongly influenced by external factors, including environmental factors. Perhaps the most important environmental influences are those that affect the health and nutritional status of their mother – for instance the high levels of risk for mothers from diarrhoeal diseases and intestinal worms in most low income settlements and from malaria in many. Pregnant mothers suffering from protein and calorie under nutrition face a greater risk of low birth-weight babies while such babies are also more likely to die in infancy. Malaria contracted by pregnant mothers is often associated with still-births or low birth weight and maternal mortality. The mother may also be exposed to chemical pollutants, some of which can cause cancer or birth defects in the foetus or kill it; examples of chemicals which are known to harm the foetus through being transferred through the placenta are lead, methyl mercury, certain pesticides, PCBs and carbon monoxide.

The quality of the environment into which an infant is born exerts a powerful influence on whether she or he will survive their first birthday and, if they do, their subsequent physical and mental development. Infants and young children are at greater risk of dying from many environment related diseases than older children or adults – for instance diarrhoeal diseases, malaria, pneumonia or measles.[88] Infections and parasites arising from contaminated food or water can contribute much to under nutrition which, in turn, retards a child's growth and lowers their immunity. Infants are also more at risk than adults from various chemical pollutants such as lead (in food, water and air) and high nitrate concentrations in water. The transfer of infants and young children from exclusive reliance on breast milk to formula milk and semi-solid and solid foods is often particularly hazardous for those living in housing which lacks safe water and the facilities needed for hygienic food preparation and storage. Infants and children are particularly at risk from various hazards commonly found in low-income areas: for instance, housing made of flammable materials combined with overcrowding and widespread use of open fires or stoves or kerosene heaters/cookers means a high risk of accidental fires. And as noted already, where provision for sanitation and garbage collection is inadequate, open sites used by children for play and sport are often contaminated with faecal matter and with household wastes (which also attract rats and other disease vectors).

The increasing mobility of the infant and young child as they learn to crawl and then to walk and their natural curiosity and desire to explore can also expose them to many environmental hazards, especially where space and facilities are lacking, both indoors and outdoors. For instance, in poor and overcrowded dwellings, it is difficult to keep chemicals used in the home out of their reach. Where provision for safe play sites is deficient, children will play on roads and garbage tips and other hazardous places.

The quality of any child's home and neighbourhood environment has a profound, direct influence on her or his physical, intellectual, social and emotional development. This influence begins from the day that they are born. The home and its wider neighbourhood are the physical and social environment in which they play. It is largely through play that they further their own development Through their intense interaction with the environment and people around them, they acquire the physical, social and mental skills they need as they grow older. They learn so much through their manipulation of objects – mud, sand, water, pieces of wood, waste materials. They learn about the property of different substances and the principle of cause and effect. They learn about their own capacity to create, and to affect and transform their environment. Through play with other children, they learn about social roles and relationships – sharing materials, agreeing on rules, learning from others.[89]

Infants and children often suffer not only from a poor physical environment in the sense of overcrowded and hazardous housing and inadequate provision for play (including dangerous and unsuitable play sites) but also from the stress and possible psycho social disorders which deficiencies in the physical environment promote in their parents or carers. Among the key psychological and social development needs of children are a need for interaction (to provide stimulation and reaction to the child), the need for consistency and predictability in their caregiving environment and a need to explore and discover.[90] It is easy to see how a poor physical environment makes these more difficult for parents to provide although perhaps a more important factor is that in many low-income households, all adults work long hours to obtain sufficient income to survive; ensuring child supervision, stimulation and care is particularly problematic in such circumstances.

Certain occupations in which it is common for children or youths to work are associated with particular environmental risks – for instance, those who make a living from picking through garbage[91] or those working in particularly hazardous industries. Many industries in Asia and Latin America make widespread use of child labour, with such children exposed to high levels of risk from dangerous machinery, heat, toxic chemicals and dust.[92] Street children who have been abandoned by their families (or have run away from home) generally face a whole range of environmental hazards: the

work they undertake may be particularly hazardous (for instance dodging traffic on major highways, selling goods to passing motorists) and they often have no adult to whom to turn when sick or injured. They generally have very poor quality accommodation (often sleeping in the open or in public places) and great difficulty in finding places to wash and defecate and to obtain drinking water and health services.[93] They are also exposed to child abuse – not least when child prostitution is one of the more dependable ways of ensuring sufficient income for survival. In addition, many children and youths imprisoned for crimes or vagrancy or placed in corrective institutions may not only have to live in a very poor quality environment but also be deprived of the child-adult relationships and stimulation that are so important for child development.[94] There are also other children in especially difficult circumstances who face particular environmental risks. For instance, a study by the Indian NGO SPARC in Bombay identified children of pavement dwellers and construction workers and "hotel boys" as particularly vulnerable, along with street children.[95] The children of construction workers who live on site lack access to schools, day care, health facilities, water and sanitation; living on construction sites also poses particular hazards for children.

Women[96]

Women are more vulnerable than men to many environmental hazards, some because of their sex (i.e. as a result of biological differences), some because of gender (i.e. as a result of the particular social and economic roles that women have, determined by social, economic and political structures).

Pregnant mothers (like their foetuses) are particularly vulnerable since "The reproductive system is particularly sensitive to adverse environmental conditions. Every stage of the multi-step process of reproduction can be disrupted by external environmental agents and this may lead to increased risk of abortion, birth defects, fetal growth retardation and perinatal death."[97]

Every year, more than half a million women die of causes related to pregnancy and childbirth[98] while 23 million suffer serious complications with child birth and 15 million suffer long-term morbidity.[99] These half a million deaths each year leave around one million children without mothers.[100] Inadequate contraception, unsafe abortion, lack of sanitation and inferior health care are some of the reasons why the risk of dying in childbirth is over 100 times greater among poor women in developing countries than among women in developed countries.[101] The absence or very poor quality of health services for childbearing women is the main cause[102] but environmental factors are also important, especially the water-related, airborne or food borne diseases associated with poor quality housing and a lack of basic services which contribute to under-nutrition and ill-health. A woman's health and nutritional status substantially affect her capacity to cope with difficulties during pregnancy, childbirth and the post-

partum period, to produce a strong healthy baby and to breastfeed and care for it.[103]

The risk for a mother of dying during pregnancy or childbirth in a poor urban district can be 1,000 times or more that for a mother from a wealthy household living in a healthy environment with good quality health services and ante-natal and post-natal care. This particular vulnerability during pregnancy, childbirth and the period just after childbirth is biologically determined, although the low priority given by governments and aid agencies to reducing this vulnerability is socially determined.

Women are generally far more severely affected than men by poor and over-crowded housing conditions, and by inadequate provision of water, sanitation and health care (and also schools and nurseries) because they take most responsibility for looking after infants and children, caring for sick family members and managing the household.[104] It is generally women who are responsible for the disposal of human wastes when provision for sanitation is inadequate and this exposes them to diseases associated with human excreta. It is generally women who are responsible for disposing of household wastes, when there is no regular waste collection service. The fact that women take most responsibility for child-care means that they also have to cope with most of the illnesses and injuries from which infants and children suffer. Caring for the sick and handling and laundering soiled clothes are particularly hazardous tasks when water supplies and sanitation and washing facilities are inadequate.[105]

The people within a household who are responsible for water collection and its use for laundry, cooking and domestic hygiene also suffer most if supplies are contaminated and difficult to obtain – and these people are generally women or girls. Women often suffer more than men from chronic back pain, because they have to collect water from wells or public standpipes; policy makers almost always have piped water systems in their homes and they forget just how heavy water is and the immense physical effort needed to fetch and carry enough water for a household's needs even from standpipes 20-30 metres from a house.

Tuberculosis is a particularly serious problem among low income urban dwellers living in overcrowded conditions and suffering from under-nutrition. Women seem to be most vulnerable to tuberculosis in their early and reproductive years and the biological changes that occur in those years may make women more likely to progress to tuberculosis once infected. Tuberculosis is also an indirect or contributory cause to many maternal deaths. As a study of household environmental management in Accra noted,

> "Household and neighbourhood level environmental problems do not receive the attention they deserve in environmental debates and this probably reflects, at least in part, a form of gender discrimination: once the water has

left the tap, the fuels have been purchased, and more generally the environmental problems have entered the home, they are considered less important "private" problems. But since "private" environmental problems tend also to be "women's" problems, the seemingly rational emphasis on "public" problems can easily mask a lack of concern for women's problems."[106]

A large proportion of urban households in developing countries use coal, wood or other smoky fuels for cooking and, where needed, heating in open fires or poorly vented stoves. It is generally women (or girls) who take responsibility for tending the fire and doing the cooking and who inhale larger concentrations of pollutants over longer periods.[107] It is usually women who take responsibility for firewood gathering and subsistence crop and livestock production in the millions of urban households where these are important components of households' livelihoods; rarely, if ever, do urban housing schemes make allowances for these activities and urban land use and zoning regulations usually discriminate against such tasks.[108]

> "The main reason why household energy management, indoor air pollution and other health consequences of unsafe kitchens are receiving so little attention is that the managers of energy resources in households are almost always women. In all cultures women's status tends to be lower than men's, which often means that neither women's household problems nor the technical expertise they can bring to bear on these problems are taken seriously enough. Moreover, household work everywhere is unpaid, invisible, low-status work which is not included in national economic statistics. Yet the enormous amount of time it takes a woman to do this work has significant implications for the health of her entire family."[109]

This section has sought to highlight how women are more vulnerable than men to certain environmental risks in many urban settings and the reasons for this. But as the discussion of maternal health issues made evident, these environmental risks have to be understood within a broader context. For instance, one of the reasons that women have difficulty finding better quality housing with the basic services that greatly reduce environmental hazards is the discrimination they face in obtaining employment, purchasing or renting housing and obtaining credit. Many problems also arise from a complex combination of environmental and non-environmental factors. For instance, domestic violence which is a serious and often growing problem to which women and children are particularly vulnerable may arise from, or be much increased by, poor quality and overcrowded housing and living environments. Such housing environments also contribute to a higher incidence of mental disorders and social pathologies and obviously, the adults that spend most of their time in the home looking after children (generally women) are most at risk.[110]

FOCUS ON POLICY 3: **Improving housing conditions as a means to reduce environmental problems and reduce poverty**

Earlier sections have made clear the many environmental hazards that exist within poor quality housing inadequately provided with basic infrastructure and services. They also pointed to the very large health-impacts these have and how it is generally infants and children and the adults who look after them (usually women) who bear most of this health burden. If donor interventions can improve housing conditions for low income groups, including adequate provision for piped water, sanitation and drainage and regular garbage collection, this also transforms the quality of their environment.

Few development cooperation agencies give priority to these kinds of shelter programmes; many provide no support at all. In part, this is a result of 'housing' being seen as 'consumption' or as an unproductive investment. In part, it reflects the many ineffective government housing programmes 'for low income groups' which in the past produced few units, usually with high unit costs and often in locations that are too far from income-earning opportunities for low income groups. However, there is a new generation of shelter programmes that support low income households in building, buying or extending their homes and obtaining improved infrastructure and services (either through negotiating provision from outside agencies or building it themselves). These can bring multiple benefits for poverty reduction and for environmental improvement.

REDUCING HEALTH BURDENS: Earlier sections have mentioned the many infectious and parasitic diseases, and disease vectors that are associated with poor quality or overcrowded housing and with inadequate provision for water, sanitation, drainage and garbage management. Also the physical hazards such as the combination of overcrowding, the use of open fires or kerosene stoves and flammable buildings which means many burns, scalds and accidental fires. Open fires or poorly vented stoves are also associated with poor respiratory health. Health burdens are further increased for those who develop their homes on flood plains or steep slopes, because no other site is available or affordable.

Individuals and families suffer not only from this health burden but also from the loss of income through days off work and high treatment costs. In Karachi, the low-cost sanitation system supported by the Orangi Pilot Project brought the cost of good quality sewers down to the point where the cost of installation per household is likely to be less than the savings made in one year from reduced time off work and treatment costs, because of improved health. A study in a 'slum' area in Khulna (Bangladesh) highlighted the very large economic burden caused by poor health associated with poor quality housing – and how the economic cost in terms of income lost from days off work and from medical expenses was greater than the cost of improving the infrastructure to eliminate the health problems.[111]

INCREASING INCOMES: It is generally assumed that low income households cannot afford their own homes – especially if they acquire or build one through loan finance. But acquiring a legal home may also bring substantial cost-savings. Better quality homes mean less ill health and reduced costs as noted above. For many low income groups, acquiring their own shelter also means not having to pay rent – and this can be a great saving as many tenant-households spent more than a third of their income on rent. Households who rent rooms or live in illegal settlements may also be paying high prices for other services. For instance, in Mumbai, a group of pavement dwellers were paying three times more for illegal electricity connections than the official price charged for legal connections. The inhabitants of many illegal settlements have to pay high costs for water to vendors and there are examples of piped water systems installed in low income settlements which provided cheaper, safer and far more convenient supplies than water vendors yet cost each household less than they previously paid to vendors while also recovering costs. There are also examples of this in sanitation.

INCREASING THE POOR'S ASSET BASE: For low income urban dwellers who acquire their own shelter (usually within illegal or informal developments), their homes are their most valuable asset. If they can obtain secure tenure of the land plot, they can improve and extend their homes, when resources are available – which combines improvements in their living conditions with increases in their asset base or increased incomes (for instance through extending their house to allow a small business to operate there or building rooms which can be rented out). Acquiring legal tenure also means a better chance of obtaining loans (with the house providing the collateral) and connections to piped water, sewers and electricity (since official utilities often refuse or are not allowed to serve 'illegal' settlements).

OTHER ECONOMIC BENEFITS: Community-led housing programmes - whether upgrading or new developments – can bring many other benefits:

➡ **local multiplier linkages** through increased demand for labour and services and also for building materials, fixtures, fittings or components made locally;

➡ **major time-savings**, especially for women and girls (for instance time saved when water no longer needs to be collected by hand and when garbage no longer needs carrying to distant dumps or buried);

➡ extended housing allowing **income generation**. For instance, the women's bank in Sri Lanka originally provided loans for micro-enterprises but extended their lending to housing because it supported home-based industries – for instance food producers having increased space for food preparation and improved ventilation; garment producers could have space for private fittings, storage and product design; and traders and shopowners could enlarge windows for trading. When housing and neighbourhood conditions improve, generally more local businesses develop.

COMMUNITY DEVELOPMENT: Low income groups who work together to address their housing problems often develop the capacity to negotiate more resources and services from government agencies. Many small community-initiatives in squatter settlements to address some specific need (for instance improved water or garbage collection) develop into more ambitious programmes which strengthened a representative community organization that could negotiate legal tenure from local authorities. Many communities that organize to improve housing and basic services also develop the capacity to work together to address other development needs.

CHILDREN'S DEVELOPMENT: Safe, secure and healthy housing brings tremendous benefits for children. When low income groups acquire such housing, it brings dramatic falls in infant and child mortality and morbidity. But children's physical, mental and social development are also much enhanced by safe and secure places to live, study and play – and by homes that allow them to avoid the constant movement and forced evictions that are so common for low income families. The time-savings brought by good quality housing also reduces work burdens for children (especially girls) and may permit parents to spend more time with their children.

REDUCED VULNERABILITY: From the above, it is obvious that safe, secure and healthy housing can greatly reduce the vulnerability of low income households. Serious illnesses and the costs of medicine or other treatment costs are among the most common causes of impoverishment – and improved housing also means much reduced health risks. Better quality homes on sites with drainage reduce risks from floods and storms. And when incomes drop, houses can be used as collateral for emergency loans or as sources of income.

WHAT ABOUT THE COSTS?: There are many examples of good projects to support improved housing for low income groups which were not expensive. Indeed, when projects seek to keep down costs and use loan-finance when appropriate, full cost-recovery is often possible, with funds recovered available to further extend the project – see for instance the experience of Sida's support for housing programmes in Costa Rica and Nicaragua. [112]

3.7 Achieving a high quality city environment

The focus of this section up to now has been on reducing or removing the health problems that can arise from the concentration of people, enterprises and motor vehicles within a city. In terms of public responses, it has sought to emphasize avoidance or prevention of environmental problems and rapid and effective treatment for any illness or injury that they cause. Another important aspect of managing any urban environment is ensuring provision or protection of those facilities that make the environments more pleasant, safe and valued by their inhabitants. This includes ensuring sufficient area and quality of open space per person (for instance in terms of parks, public squares/plazas, provision for sport and provision for children's play) and a concern that all city dwellers have access to such provision. Integrated into this should also be a concern to protect each city's natural landscapes with important ecological and/or aesthetic value – for instance wetland areas, river banks or coasts. So too should a concern to protect the monuments, buildings, public spaces and neighbourhoods that are important parts of the city's history. There are good economic reasons for this – attractive and pleasant cities are more likely to attract new investments and tourists – but a large part of the rationale for this is also responding to the needs and priorities of city dwellers.

There are obvious links between ensuring sufficient provision for public space and the prevention of injury and disease. For instance, ensuring adequate provision for children's play in each neighbourhood of a city that is safe, well-maintained, accessible and managed in ways to serve the needs of different income groups and age groups can greatly reduce accidents as fewer children play on roads, garbage tips or other unsafe areas. Such provision can also contribute much to children's physical, mental and social development. [113] Such provision is particularly important in the lower income areas of cities which lack adequate provision for water, sanitation and drainage and where housing is generally overcrowded – as it allows children to play without exposing them to the risk of faecal contamination or garbage or infection from disease vectors. [114] City populations often give considerable value to accessible open space; it is worth noting that one of the key mobilizing forces for the development of a local agenda 21 in Chimbote (Peru) was the threat of a much used and appreciated park being closed. [115] And as Chapter 4 will emphasize, a key aspect of ensuring adequate provision (and protection) of ecological and cultural resources is through more participatory, democratic decision-making processes that allow the needs and priorities of all groups in a city to influence priorities and resource allocations.

Improving the quality of the urban environment can often be combined with reducing environmental problems. For instance, provision for water bodies in parks and the

protection of wetlands can be integrated into systems for treating stormwater and for reducing the risk of flooding or limiting flood damage when it occurs. Planting trees in cities and suburbs can be justified for their aesthetic value and also for their contribution to, among other things, reducing cooling costs, absorbing pollutants, acting as windbreaks and noise barriers and absorbing carbon. In hot climates, open spaces with trees can provide welcome relief from the heat, especially when combined with lakes, streams and rivers which can provide more comfortable micro-climates.[116] Support for urban agriculture can be integrated into provision for open space and the re-use of waste waters – and can prove particularly important for improving the diets and livelihoods of low income groups in most urban centres.[117] Increased provision of parks in each neighbourhood of a city can be combined with hazard prevention and environmental education – as in the eco-parks in Manizales (Colombia), many of which are on land well-suited to parks but ill-suited to dwellings because of landslide risks.[118]

Ensuring provision for public space within each neighbourhood in ways which respond to the diverse priorities of the different groups within the population is rarely given much attention. As a result, little or no provision for public space becomes built into the urban fabric and as all land sites are developed for urban activities, it becomes almost impossible to remedy this deficiency. In addition, pressure from middle and upper income groups for public action to address this may be much lessened as their purchasing power allows them exclusive access to such resources – through purchasing or renting homes with gardens or homes in areas with good provision for open space or through membership of clubs which allow members access to open space or beaches or provision for sports. The capacity of middle and upper income groups to pay for such provision may not only reduce pressure for more public provision but the country clubs, sports clubs, golf courses and private beaches may also pre-empt land and natural resources that had previously been open to use by all city inhabitants.

3.8 Regional and global impacts

Regional impacts

Previous sections concentrated on environmental problems within city boundaries. This section reviews the range of environmental problems that occur outside the boundaries of urban areas that come from or are influenced by urban-based activities' demand for resources or generation and disposal of wastes.

Cities transform natural landscapes not only within the built-up area but also for considerable distances around them. This is because of

➡ the expansion of the built up area which means that land surfaces are reshaped, valleys and swamps filled, large volumes of clay, sand, gravel and crushed rock extracted and moved and water sources tapped – and rivers and streams channelled;[119]

➡ the demand for the products of fertile land, watersheds and forests concentrated in cities; and

➡ the solid, liquid and air-borne wastes transferred to the region beyond city boundaries which have environmental impacts, especially on water bodies where liquid wastes are disposed of without treatment and on land sites where solid wastes are dumped without measures to limit their environmental impact.

REGIONALLY: there are six impacts of particular concern: [120]

1. **Unplanned and uncontrolled city expansion.** In the absence of any plan or effective control over new developments, cities generally expand haphazardly – defined by where different residential areas and productive activities locate, legally and illegally. The result is what might be termed a "patchwork" of different developments, including many high density residential settlements interspersed with vacant land (often held for speculative purposes). In cities where a significant proportion of the population can only find accommodation in illegal or informal settlements, city expansion will be much influenced by where illegal settlements develop. This process has serious social and environmental impacts. These include the segregation of the poor in the worst located and most dangerous areas and the greatly increased costs of providing basic infrastructure (such as roads and pavements, water mains and sewage pipes), public transport and social services.[121] Illegal or informal settlements also often grow on hazardous sites, especially where these present the best location for the illegal, low income settlers in terms also of being able to avoid eviction.

2. **Loss of agricultural land.** Many cities are located within their nation's most valuable agricultural land and much of their expansion is over such land. Other urban demands can also mean the loss of agricultural land and of other sites with valuable ecological functions – for instance the demand for building materials and landfill. Measures which are meant to protect such land sites often proving ineffective.[122] Urban land markets can also disrupt agricultural production and the livelihoods of those who depend on such production for areas that stretch far beyond sites developed for urban use. There are also conflicts over land-use priorities between urban based demands and environmental perspectives; examples include the loss of agricultural lands and of forests,

wetlands and other undeveloped sites to golf-courses and country-clubs. These conflicts generally involve social conflicts too as the livelihoods of those who depend on the agricultural lands or forests are threatened by urban-based demands.[123]

3. **Generation and disposal of liquid wastes.** Changes brought to the hydrological cycle by the city's construction and its systems for water, sanitation and drainage usually bring damaging consequences 'downstream'. In addition, as provision for sewers and drains improves in the city, the disposal of untreated waste waters often pollutes nearby lakes, rivers, estuaries or the sea. River pollution from city-based industries and untreated sewage can contribute to environmental impacts including health problems in settlements downstream. Rivers that are heavily contaminated as they pass through cities may become unusable for agriculture downstream, or particular contaminants in the water may damage crops or pose risks to human health. In many cities, industries dump liquid wastes down wells and contaminate groundwater.

In most urban centres, these problems are not easily addressed by 'end of pipe' treatment because of the large proportion of enterprises and households not connected to sewers or drains. The high proportion of solid wastes that are uncollected also adds to the scale of non-point source pollution.

Fisheries are often damaged or destroyed by liquid effluents arising from cities. Thousands of people may lose their livelihood as a result, as some of the largest cities are close to some of the world's most productive fishing grounds.[124]

4. **Solid waste disposal.** As noted in section 3.4, it is still common for most of the solid wastes that are collected within urban centres to be dumped on some site outside the city with no preparation of the site to minimize the threat of seepage and leaching contaminating local water resources and with no provision to cover the wastes to reduce the breeding of disease vectors and uncontrolled burning. Ecologically valuable wetlands may also be chosen as new dumpsites. The inadequacies in the management of hazardous wastes was also noted earlier.

5. **Acid precipitation.** Sulphur and nitrogen oxides discharged by power stations burning high sulphur coal or oil, and from automobile exhausts can turn rain into acid rain which falls to earth a considerable distance from the emission source. The result can be declining or disappearing fish populations and damage to soils and vegetation. Toxic metals may also be leached from the soil into water used for animal or human consumption or lead, cadmium or copper mobilized by acidic drinking water supplies from piped water systems. Acid precipitation is

causing concern in the areas surrounding many of the larger and more industrial cities in Latin America and Asia.

The air pollutants that cause the most damage to forests, soils and agriculture are sulphur dioxide, oxides of nitrogen and ozone (and other photochemical oxidants) and, in certain instances, fluorides.[125] Sulphur dioxide and the oxides of nitrogen resulting from fossil fuel combustion in cities can be deposited directly from the air onto farmers' fields (dry deposition) or from rain, clouds/fog or snow acidified by these chemicals. Both can damage plants at high concentrations (causing acute damage, especially to certain species of plants that are particularly sensitive to exposure) although reaching the concentrations necessary to achieve this are rare, except in the immediate vicinity of intense sources of emission (for instance metal smelters with no pollution controls and lacking high chimneys). At lower concentrations, both sulphur dioxide and the oxides of nitrogen are associated with reductions in yields and growth for many crops, although there are many other factors which can influence this.[126] Soils are also at risk since, in many tropical and subtropical countries, the soils are already acidic and are unable to buffer any further increases in acidity.

6. **Depletion of freshwater resources.** Many urban centres now face difficulties in obtaining sufficient freshwater and this is even the case in cities where half or more of the population are not adequately served with safe, sufficient supplies. Many cities have outgrown the capacity of their locality to provide adequate, sustainable water supplies or have over-used or otherwise mismanaged local sources so these are no longer available – for instance, for many coastal cities, local aquifers that have been over-pumped, resulting in saltwater intrusion. Over-exploitation of underground water has also caused serious problems of subsidence for many buildings and sewage and drainage pipes in many cities.[127] Freshwater resources may be drawn from further afield and in so doing pre-empt resources previously used by farmers or other rural dwellers or damage ecosystems.[128]

Difficulties in obtaining sufficient fresh water are particularly acute in the many urban centres in relatively arid areas that have also grown beyond the point where adequate water supplies can be drawn from local or even regional sources. Many urban centres in Africa's dryland areas face particularly serious problems because of a combination of rapid growth in demand for water and unusually low rainfall in recent years, with the consequent dwindling of local fresh water resources. These and many other cities face problems in financing the expansion of supplies to keep up with demand – as the cheapest and most easily tapped water sources have been tapped and drawing on newer sources implies much higher costs per unit volume of water.[129]

The extent of the environmental changes caused by any urban centre on its surrounds and the size of the area that has been changed is much influenced by the urban centre's size and wealth, as well as the nature of its production base and of the resource endowments of the region around it. It is also much influenced by the quality of environmental management both within the centre and in its surrounding region. Although this section has focused on the environmental damage that can arise in the regions around cities, there is also the fact that city consumers and enterprises provide the main market for rural produce while rural inhabitants and enterprises draw on urban enterprises for goods and services. Urban markets can provide not only rural incomes but also the basis for rural investments in better environmental management. In addition, a significant proportion of low income rural households also depend on urban markets or on urban employment for a significant part of their livelihood.[130]

Although much of the literature on the generation and transfer of environmental costs from cities concentrates on the region around cities, the demands that the larger and wealthier cities concentrate for food, fuel and raw materials may be increasingly met by imports from distant ecosystems with much less demand placed on the surrounding region – which makes it easier to maintain high environmental standards in this region and, for instance, to preserve forests and natural landscapes. In addition, the goods whose fabrication involves high levels of fossil fuel consumption, water use and other natural resource use, and dirty industrial processes (including the generation of hazardous wastes) and hazardous conditions for the workforce can be imported. The possibilities for enterprises and consumers to import such goods from a greater distance is much helped by the low price of oil.

Other cost transfers are into the future. For instance, air pollution may have been cut in many of the world's wealthiest cities but emissions of carbon dioxide (the main greenhouse gas) remain very high and in most cities may continue to rise – for instance because of increasing private automobile ownership and use. This is transferring costs to the future through the human and ecological costs of atmospheric warming. The generation of hazardous non-biodegradable wastes (including radioactive wastes) or non-biodegradable wastes whose rising concentrations within the biosphere has worrying ecological implications is also transferring costs to the future. So too are current levels of consumption for the products of agriculture and forestry where the soils and forests are being destroyed or degraded and biodiversity reduced.

Mapping ecological cost transfers

It is difficult to estimate the ecological costs that arise from producing the large and diverse range of raw materials, intermediate goods and final goods that meet the demands of city producers and consumers. It also varies so much from place to place and there are many examples of intensive rural

production for urban markets combined with good environmental management. But the scale of resource demands concentrated in cities, especially on large and wealthy cities within OECD countries, encouraged the development of new concepts to help map out and to begin to quantify the scale and nature of these inter-regional or international transfers.

The calculation of cities' "ecological footprints" developed by William Rees[131] is one of these. This makes evident the large land area on whose production the inhabitants and businesses of any city depend for food, other renewable resources and the absorption of carbon to compensate for the carbon dioxide emitted from fossil fuel use. Some care is needed in using such a concept for at least two reasons. The first is that while a city's consumers and enterprises do draw on the productivity of a large land area, this also provides livelihoods for those living there – and may provide the basis for investments in sustainable production. Second, large ecological footprints are associated with large and wealthy cities; most urban centres in developing countries have very small ecological footprints.

It is also possible to measure the ecological footprints of particular activities – and these highlight how much of the ecological footprint of a city is caused by higher income groups (especially those with high consumption lifestyles) and by particular enterprises.[132] It is also worth noting that high income households in rural or suburban areas generally have larger ecological footprints than those living in cities.[133] Another concept that helps reveal the reliance of wealthy cities on non-renewable resources is through calculating the 'material intensity' of the goods consumed in that city (or what is sometimes termed these goods' ecological rucksack). The material intensity of any good can be calculated, relative to the service it provides, as a way of providing a quick and rough estimate of its environmental impact.[134] This calculation can include all the energy and material inputs into any good from the extraction or fabrication of materials used to make it through its use to its final disposal. It can also include consideration of how much service that good provides including how long it lasts – so, for instance, a fridge or car that lasted 20 years would have less material intensity than one that lasted 10 years. There is also the long-established practice of calculating the energy-intensity of different goods which can also take into account the energy used in their fabrication, transport, preparation for sale, sale, use and disposal. Since in most instances, most or all of the energy input comes from fossil fuels, this allows an idea of how the use of this good contributes to the use of fossil fuels and the generation of carbon dioxide (the largest contributor to atmospheric warming) – and perhaps also some idea of the air pollution implications of its fabrication, use and disposal.

It is important to remember that most of the ecological costs that cities pass on to other people, other ecosystems or into

the future arise from the consumption patterns of wealthier groups and the production systems of particular enterprises. Although earlier sections on environmental hazards highlighted how it is generally low-income groups that are most affected and how low-income areas of cities have the worst environments, low-income urban citizens generally contribute much less to the transfer of environmental costs to other ecosystems or into the future. Average use per person of non-renewable resources among low income groups is very small, largely because they own and use few capital goods and have low levels of use of fossil fuels and electricity. Their generation of waste per person is, on average, much lower than for higher income groups – including per capita levels of greenhouse gas emissions and stratospheric ozone-depleting chemical emissions. In most urban centres, low-income groups are also among the most assiduous collectors and users of recycled or reclaimed materials.[135]

While concepts such as 'ecological footprints' and 'ecological rucksacks' have helped to make apparent the extent to which modern cities can generate environmental costs far from their boundaries, it is difficult to quantify all such transfers. For instance, the long term health and ecological consequences of many chemical wastes are unknown – including those arising from the accumulation of certain persistent chemicals. It is also difficult to estimate the scale of the health risks faced by the workers and their families who make the goods which the consumers and enterprises within wealthy cities use. It is also difficult to adjust the calculations for a city's 'ecological footprint' to take account of the goods and services that its enterprises produce for those living outside its boundaries. Measures are needed to reduce the ecological footprint of wealthy and large cities, but this must not detract from cities' key roles within the efficient, prosperous, innovative and flexible economies that all nations want to develop. And as chapter 2 stressed, prosperous cities with high quality environments can also be highly efficient in their use of resources and generation of wastes.

3.9 Integrating environmental agendas within sustainable development

Perhaps the most important distinction between an 'environmental' perspective on cities and a 'sustainable development' perspective is that the latter seeks not only to address environmental problems within city boundaries but also to reduce the transfer of environmental costs generated within cities to other people, other ecosystems or into the future.

> "In order to move towards sustainable development, it is essential to address the way in which our current political, economic and social systems allow widespread cost-

transference to take place, where many of the negative environmental and related impacts of the activity of a person, company or even region are in effect displaced elsewhere."[136]

Some care is needed in addressing 'sustainability' issues in developing countries since these can marginalize the primary environmental concerns of the poor, even as they claim to incorporate them.[137] Most of the environmental health problems discussed in earlier sections have very little connection with the depletion of natural capital – in terms of resource use or disruption of local eco-systems or global cycles.

If we take the Brundtland Commission's insistence that sustainable development is about meeting "the needs of the present without compromising the ability of future generations to meet their own needs,"[138] this has clear implications for environmental agendas in urban areas. Figure 3.1 makes explicit the main components of 'meeting the needs of the present' in the first box, with the second making clear what also needs to be done to ensure this does not compromise the ability of future generations to meet their own needs – i.e. that it is ecologically sustainable. The environmental agenda within cities that was the focus of sections 3.1 to 3.7 is largely located within the first box, with the environmental agenda that is about reducing the transfer of environmental costs to the region around urban areas or distant people or ecosystems or into the future that is the focus of 3.8 to 3.9 is within the second. The second box also includes other aspects of 'capital' which future generations need including institutional structures which support human rights and good governance and more generally each society's knowledge, experience and rich cultural heritage.[139] As Chapter 4 will describe, many local agenda 21s developed by urban governments in partnership with their citizens seek the best fit between the economic, social, political and environmental goals outlined in Figure 3.1.[140]

Five interconnected equity principles move to centre place in any discussion of sustainable development[141] and these have particular relevance to urban areas. Two of them are clear within the Brundtland Commission's statement:

➡ **inter-generational equity** (development that does not compromise the ability of future generations to meet their own needs)

➡ **intra-generational equity** (which is implied by a commitment to meeting the needs of the present).

The three others are:

➡ **transfrontier equity** (which prevent urban consumers or producers transferring their environmental costs to other people or other ecosystems as discussed in 3.8)

➥ **procedural equity** (to ensure that all person's legal rights are respected, that they are fairly treated and that they can engage in democratic decision-making processes); and

➥ **inter-species equity** (with the rights of other species recognized).

When development cooperation agencies consider how to apply a sustainable development framework to their urban policies and projects, there are obvious tensions between different goals within the two boxes in Figure 3.1 and also between the different equity goals noted above. Most centre on the extent to which projects justified for their contribution to expanding production (which in turn is meant to increase incomes) contribute to the depletion of one or more aspect of natural capital – for instance fossil fuelled power stations or much expanded highway systems which will increase greenhouse gas emissions. There are also 'rural' versus 'urban' conflicts as in, for instance, large hydro-electric dams whose construction involves flooding large areas of agricultural land and forest with most of their output destined for urban enterprises or consumers. Expanding urban areas inevitably draw more on the resources of their wider region; increasingly prosperous urban areas almost inevitably draw more heavily on non-renewable resources and create more wastes.

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

➥ systems for the management of liquid and solid wastes which reduce environmental hazards for city dwellers and also reduce non-renewable resource use (through promoting waste minimization, reuse and recycling) and reduce the ecological damage that previously arose from polluted surface run-off.

➥ improvements to public transport which better meet the transport needs of most citizens (especially lower income groups), reduce physical hazards and keep down air pollution and greenhouse gas emissions.

Although there will still be trade-offs – for instance, the cheapest or most robust buses may not be the best performers in terms of air pollution and fuel use – decisions made within an awareness of such trade-offs and with procedural equity should considerably reduce the conflicts between environment and development. One of the more controversial aspects is in regard to the choice of systems to improve sanitation – but health and ecological concerns can be combined – see Box 3.4

Figure 3.1: The multiple goals of sustainable development as applied to cities[142]

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

➥ *Economic needs* – includes access to an adequate income/livelihood or productive assets; also economic security when unemployed, ill, disabled or otherwise unable to work

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

➥ *Social, cultural and health needs* – includes health care, education, transport. Needs related to people's choice and control – including homes and neighbourhoods which they value and where their social and cultural priorities are met – are also important

➥ *Political needs* – includes freedom to participate in national and local politics and in decisions regarding management and development of one's home and neighbourhood – within a broader framework which ensures respect for civil and political rights and the implementation of environmental legislation.

Achieving the above implies a more equitable distribution of income between nations and, in most, within nations.

SUSTAINABLE DEVELOPMENT AND CITIES

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

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

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

➥ *Non-biodegradable wastes/emissions not overtaxing (finite) capacity of local and global sinks to absorb or dilute them without adverse effects* (e.g. persistent pesticides; greenhouse gases and stratospheric ozone-depleting chemicals).

➥ *Social/human capital* which future generations need including institutional structures which support human rights and good governance and more generally the passing on intact of knowledge, experience and each nation's rich cultural heritage.

Box 3.4: Combining ecological and health considerations for city sanitation

Water-borne sewers, when well managed, provide a very safe and convenient way by which households can dispose of their human wastes. From an environmental health perspective, they are very effective. Although considered to be 'expensive' solutions for the poor, there are also many examples of where costs were kept down to the point where little or no subsidy was needed in providing low income households with sewers.[143] However, from an ecological perspective, sewer systems generally require high levels of freshwater use and by collecting all the wastes within a single system, they can present serious problems in regard to what can be done with the large volume of sewage. Sewage can be treated, but going beyond primary treatment is expensive. Disposing of sewage sludge is also a problem, especially for large sewer systems.

However, potential conflicts can be minimized, if decisions about which sanitation system best addresses the needs and resources of the inhabitants of a city or settlement are made within an awareness of the short and long term ecological consequences. There are many sewer systems and toilets in operation which cut down the volume of water needed. There are also systems where treatment is decentralized and the ecological impacts of the whole sewer and drainage system is much reduced. There are many examples of 'sewage farming' and sewage-fed aquaculture which ensure the use of the nutrients in sewage and act as 'treatment' – although care must be taken to minimize health risks for those working in this and ensure no health risk to those who consume the products of sewage farming. There are also sanitation systems that require little or no water. It is important that the full range of potential solutions to sanitation problems in any city or city district are considered – but with the needs and priorities of those whose sanitation is most in need of improvement also having a central role. In pursuing sanitation systems with less ecological impact, there is a danger of promoting systems which bring inconvenience, higher maintenance costs and greater environmental risks to the users – or of simply producing latrines which the population do not use.

There are other potential conflicts between environmental goals and social and economic goals – and it is difficult to envisage prosperous and healthy cities that do not draw on natural capital. However, it is possible to envisage the development of prosperous, healthy cities which have a much reduced draw on natural capital in comparison to those that are common today – and how such a development can address all five equity principles noted above.[144]

It will be difficult to promote such a development within urban policy and the practice of urban management without a coherent and supportive national policy and without international agreements. City governments are accountable to the populations living within their boundaries, and not to those living in distant ecosystems on whose productivity the city producers or consumers may draw. It is also difficult to ensure that the needs and rights of future generations and of

other species receive adequate attention in urban policy and practice. In addition, although there are examples of cities whose local agenda 21s or other environmental action plans have included components to reduce their transfer of environmental costs, the scope for such action will be limited by the need for all cities to be competitive in attracting new investments. For instance, no city can promote large reductions in greenhouse gas emissions if this increases costs for many enterprises to the point where it encourages them to move to another city where no measures are taken to promote such reductions. This suggests the need for more connection between urban development and national sustainable development plans – a connection that many existing national plans fail to develop.

3.10 How priorities will differ from city to city

The fact that the scale and relative importance of different environmental problems differs so much from city to city was stressed earlier. This makes it impossible to make universally applicable recommendations, except that donor decisions in any city must be made with a good knowledge of each particular city context – including the needs and priorities of low income groups. This section discusses what influences the scale, range and relative importance of environmental problems in any city.

Table 3.7 shows how the relative importance of different environmental problems varies in relation to the size, per capita income and economic base of the city or the per capita income of the nation in which it is located. The most serious environmental problems for most urban centres in most low income nations and many middle income nations (category 1) are those associated with poor environmental health – as a high proportion of households do not have safe and sufficient water supplies and provision for sanitation, drainage and garbage collection. Such urban centres do not have high levels of resource use, waste generation and greenhouse gas emissions (and so have small ecological footprints). Thousands of small urban centres in developing countries fall into this category – where the urban centre itself is 'sustainable' in the sense of a very limited draw on regional, national or global resources and sinks but very unhealthy and with a high proportion of its inhabitants surviving with below poverty line incomes. For the larger urban centres within this category, there may be serious environmental problems such as soil erosion and deforestation around the centre – as was recently documented for the city of Bamenda in Cameroon – but these generally relate more to inadequate management than to a shortage of resources.[145]

In contrast to such urban centres, there are the cities in category 4 in higher income countries where the main environmental

problems are no longer within the city as most of the population is provided with piped water, sanitation, drainage and solid waste removal – as in some of the best managed cities in Asia and Latin America. But in such cities, the collective impact of the consumption and waste produced by city inhabitants and city businesses on regional and global resource bases and systems is generally much higher – although it may still be relatively low compared to cities in Europe and North America.[146] Between these two extremes are two other categories – where large sections of the population still lack provision of environmental infrastructure and services but the proportion of unserved population is lower than in category 1. Cities in these two intermediate categories also generally have increasing problems linked to industrial and/or motor vehicle pollution.

Of course, cities do not fit neatly into one of the four categories and there are large differences in the levels of resource use and waste generation between cities with comparable levels of income per person. The Table is a reminder of the way in which the nature, scale and relative importance of environmental problems differ between cities of different size, wealth and economic base. It makes evident why development assistance to address environmental problems should have very different priorities for urban centres whose environmental problems are similar to those listed in Category 1 when compared to Category 3 or 4. Table 3.7 should also not be taken to imply that all large cities are wealthy cities, although in most countries other than the most urbanized, the largest cities are also generally the wealthiest cities within their own national context. It should also not be taken to imply that environmental problems in cities tend to lessen as per capita incomes grow. Perhaps the most.

important influence on the scale of environmental problems and on the extent to which these increase or diminish with economic growth is the capacity, competence and accountability of urban authorities. This is a point that discussions on how cities' environmental problems change as they get wealthier tend to forget.

Table 3.7: Typical environmental problems for urban centres of different sizes and within nations with different levels of income

SOURCE: This draws on but modifies considerably a table in Bartone, Carl, Janis Bernstein, Josef Leitmann and Jochen Eigen (1994), *Towards Environmental Strategies for Cities; Policy Considerations for Urban Environmental Management in Developing Countries*, UNDP/UNCHS/World Bank Urban Management Program, No. 18, World Bank, Washington DC, 115 pages.

ENVIRONMENTAL PROBLEMS AND INFLUENCES	Category 1: Most urban centres in most low-income nations and many middle income nations	Category 2: More prosperous cities in low and middle income countries - including many that have developed as industrial centres	Category 3: Prosperous major cities/metropolitan areas in middle and upper income countries	Category 4: Cities in upper-income countries
ENVIRONMENTAL HAZARDS WITHIN THE HUMAN ENVIRONMENT				
1. Those linked mainly to inadequate provision for - water supply and sanitation - drainage - solid waste collection - primary health care	Many or most of the urban population lacking water piped into the home and adequate sanitation. Also many or most residential areas lacking drainage so such areas often having mud and stagnant pools. Many residential areas at risk from flooding. Many or most residential areas also lacking services for solid waste collection and health care, especially the poorer and more peripheral areas	Piped water supplies and sanitation systems reaching a considerable proportion of the population but a large proportion of low-income households not reached, especially those in illegal or informal settlements on the city periphery. Typically, solid waste collection and health care reaching a higher proportion of the population than in category 1 but still with between a third and two thirds of the population unserved	Generally acceptable water supplies for most of the population. Provision for sanitation, solid waste collection and primary health care also much improved, although 10-30 percent of the population still lacking provision (or adequate provision). The proportion of people lacking adequate services generally smaller than in category 2 but in very large cities, this can still mean millions who lack basic services. In large metropolitan areas, service provision often least adequate in the weakest, peripheral municipalities	Provision of all four services for virtually all the population.
2. Those linked to physical and chemical hazards in the home and workplace	The main hazards associated with poor quality and overcrowded living and working environments - and evident in the large health impact of domestic and workplace accidents. There may be serious occupational hazards among certain small scale and household enterprises	A great increase in the problems with occupational health and safety at all levels and scales of industry. Government often not giving occupational health and safety adequate priority. A high proportion of low-income households living in illegal or informal settlements with high risks of accidental injuries - especially if they settle on dangerous sites	Improved government supervision or worker organization to ensure improved occupational health and safety. Often, a decline in the proportion of the population working in hazardous jobs. A rise in the contribution of traffic accidents to premature death and injury. Improved provision of water, sanitation, drainage and health care lessening physical hazards in residential areas	Road accidents remaining one of the most serious health threats. Occupational health problems lessened through much better health and safety standards. Active programmes usually promoting injury reduction for homes and on the roads.
3. Those linked to air pollution	Often serious indoor air pollution, where coal or biomass fuels used as domestic fuels - especially where indoor heating is needed.	Often severe problems from industrial and residential emissions. Indoor air pollution in households lessened as households with higher incomes switch to cleaner fuels.	Increasingly important contribution to air pollution from motor vehicles. Perhaps less from industry as city's economic base becomes less pollution intensive and as measures begin to be taken to control industrial emissions	Motor vehicles becoming the major source of air pollution. Little or no heavy industry remains in the city and the control of air pollution becomes a greater priority for citizens

RENEWABLE RESOURCE USE				
1. Land/soil	Urban expansion taking place with few or no controls - or where controls exist, they are largely ignored.	Urban expansion continuing to take place with few or no land-use controls; often rapid growth in illegal or informal settlements, including illegal land subdivisions; loss of farmland to expanding urban areas and to demand for building materials and aggregate.	More controls imposed on urban expansion but these often prove ineffective as illegal residential developments continue, in the face of a considerable section of the population unable to afford to buy or rent the cheapest "legal" land site or house. Different groups often in conflict over use of best located undeveloped land sites or of use of agricultural land for urban purposes.	Where there is concern for agricultural land loss, land use often tightly regulated - perhaps to the point where house prices begin to rise as land supplies for new housing become constrained. Where there is little concern, often large loss of agricultural land to suburban or ex-urban developments
2. Freshwater	Generally, the wealthier the city, the larger the use per capita with large wealthy cities also having to draw on the water resources of an increasingly large area. A strong emphasis on water conservation can considerably reduce per capita consumption in wealthy cities.			

NON-RENEWABLE RESOURCE USE				
	Generally the wealthier the city, the higher the consumption of fossil fuels and other mineral resources - although again, there are very large variations between cities with comparable per capita incomes. A strong citizen and government commitment to reducing automobile dependence, waste reduction and to re-use, reclamation and recycling can keep down per capita consumption figures in wealthy cities			

GENERATION OF BIODEGRADABLE AND NON-BIODEGRADABLE WASTES				
1. Water pollution	The main water "pollution" problems arise from a lack of provision for sanitation and garbage collection.	Most local rivers and other water bodies polluted from industrial and urban discharges and storm and surface run-off	Severe problems from untreated or inadequately treated industrial and municipal liquid wastes that are usually dumped without treatment in local water bodies	Much improved levels of treatment for liquid wastes from homes and productive activities. Concern with amenity values & toxic wastes
2. Solid waste disposal	Open dumping of the solid wastes that are collected	Mostly uncontrolled landfills; mixed wastes	A proportion of landfills controlled or semi-controlled	Controlled sanitary landfills, incineration, some recovery
3. Hazardous waste management	No capacity but also volumes generally small	Severe problems; limited capacities to deal with it	Growing capacity but often still a serious problem	Moving from remediation to prevention
4. Generation of non-biodegradable wastes (including greenhouse gas emissions)	Very low levels per capita	Generally low levels per capita	Generally intermediate levels per capita	Generally high levels per capita, although large variations between cities with comparable per capita incomes linked to number of cars per person & their use, density, commitment to energy efficiency, fuel prices etc.

OTHER ENVIRONMENTAL HAZARDS				
	No provision by the public authorities for disaster preparedness; disasters (floods, storms .....) often common with severe damage and loss of life. In cities with an industrial base, inadequate provision to guard against industrial disasters and to act to limit the damage and loss of life		Some provision for disaster preparedness	Increasingly sophisticated disaster preparedness

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Notes and references

1 This Chapter draws on WHO, Creating Healthy Cities in the 21st Century, Background Paper prepared for the Dialogue on Health in Human Settlements for Habitat II World Health Organization, Geneva, 1996, 38 pages and Satterthwaite, David, "Sustainable cities or cities that contribute to sustainable development", *Urban Studies* Vol.34, No.10, 1997, pp. 1667-1691.

2 Bradley, David, Carolyn Stephens, Sandy Cairncross and Trudy Harpham, *A Review of Environmental Health Impacts in Developing Country Cities*, Urban Management Program Discussion Paper No. 6, The World Bank, UNDP and UNCHS (Habitat) Washington DC, 1991, 58 pages

3 White, G.F., D.J. Bradley and A.U. White, *Drawers of Water: Domestic Water Use in East Africa*, Univeristy of Chicago Press, Chicago, 1972, ; Bradley and others 1991, op. cit.

4 The literature tends to emphasize how environmental problems in cities tend to diminish, once a certain per capita income as been reached – in what is often referred to as the environmental Kuznets curve. This literature gives surprisingly little attention to the nature and quality of governance, although this is perhaps the most important influence on the extent of basic infrastructure and service provision and on the extent to which pollution control, good practice in the collection and management of solid wastes and occupational health and safety are implemented – which in turn are a major influence on the diminution of environmental health problems. Although it is obviously difficult for the government of a city with a low per capita income to address all these, the extent to which environmental health impacts differ between cities with comparable per capita incomes suggests that more attention be given to the quality of governance and within this to the effectiveness of government in ensuring action on the main environmental health risks.

5 Bradley and others 1991, op.cit.; Stephens, Carolyn , "Healthy cities or unhealthy islands: the health and social implications of urban inequality", *Environment and Urbanization* Vol.8, No.2, October 1996,

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

7 Where provision for sanitation is inadequate and excreta-related diseases are particularly important, another useful environmental classification of excreta-related infections is into faecal-oral (bacterial and non-bacterial); soil-transmitted intestinal worms; beef and pork tapeworms, water-based worms; and excreta-related insect vectors – see Cairncross, Sandy and Richard G. Feachem , *Environmental Health Engineering in the Tropics – An Introductory* Text, John Wiley and Sons, Chichester (UK), 1983. Some of these infections are essentially solved by improved sanitation; others (such as those spread mainly by person to person contact) by improved person hygiene; others by a combination of the two.

8 WHO 1996, op. cit.

9 Improved water and sanitation can bring an 80-100 percent reduction in morbidity from cholera, typhoid, leptospirosis and scabies, a 60-70 percent reduction in trachoma, conjunctivitis, yaws and schistosomiasis and a 40-50 percent reduction in tularaemia, paratyphoid, bacillary dysentery, amoebic dysentery, gastro-enteritis, lice borne diseases, diarrhoeal diseases, ascariasis and skin infections. See WHO, *Intersectoral Action for Health*, Geneva, 1986.

10 Also many other diseases including typhoid and hepatitis A.

11 See for instance Songsore, Jacob and Gordon McGranahan, "Environment, wealth and health; towards an analysis of intra-urban differentials within Greater Accra Metropolitan Area, Ghana", *Environment and Urbanization* Vol. 5, No. 2, October 1993, pp. 10-24. Misra, Harikesh, "Housing and health problems in three squatter settlements in Allahabad, India" in Jorge E. Hardoy et al. (editors), The *Poor Die Young: Housing and Health in Third World Cities*, Earthscan Publications, London, 1990; and Adedoyin, M. and S. Watts, "Child health and child care in Okele: an indigenous area of the city of Ilorin, Nigeria", *Social Science and Medicine*, Vol. 29, No. 12, 1989, pages 1333-1341.

12 See for instance Songsore and McGranahan 1993, op. cit and Surjadi, Charles, Health of the Urban Poor in Indonesia, *Urban Health Problems Study Group paper No. 29*, Atma Jaya Research Centre, Jakarta, 1988, 45 pages.

13 Rossi-Espagnet, A., G.B. Goldstein and I. Tabibzadeh, "Urbanization and health in developing countries; a challenge for health for all", *World Health Statistical Quarterly*, Vol. 44, No. 4, 1991, pages 186-244.

14 WHO, Global Estimates for Health Situation Assessments and Projections 1990, Division of Epidemiological Surveillance and Health Situation and Trend Analysis, World Health Organization, WHO/HST/90.2, Geneva, 1990, 61 pages.

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4. Key policy approaches to improving the urban environment

4.1 Introduction

If we accept that nature on its own usually finds a long-term equilibrium, then most of the activities which undermine sustainable development come down to the decision-making behaviour of humans: individuals, communities, businesses and the state. At one level, therefore, urban environmental problems are largely the result of the huge concentrations of decisions which in some way damage the urban, regional and global environment. Sometimes these damaging decisions are made because of the poor information base, sometimes because political and economic systems reward passing costs on to others, sometimes because poverty drives decisions which favour short-term survival over long-term sustainability, and sometimes because people have not thought through the full direct and indirect impacts of their decisions. In effect most cities have inherited a legacy of political, social and economic mechanisms which, inadvertently perhaps, allow us to pass on the adverse consequences of some of our decisions, to the environment, to future generations, to other sectors of society, to other sectors of the economy.

To visualise this, simply think of which sections of a community tend to own the most cars and who bears the brunt of the resultant noise and air pollution, congestion, road building and severed neighbourhoods. And to make the link between poverty and environmental degradation more complex yet most clear, we should remember that the most dilapidated, and often therefore most polluting cars, lorries and buses, are often the only ones which the poor can even begin to afford to use. Similarly, many urban low income groups rely on the cheapest available fuels (biomass or coal), becoming a significant contributor to local air pollution. Wealth creates major environmental externalities then, but poverty too creates its own, more local externalities. This said, it is important to emphasise how little environmental degradation is linked to poverty. In general, the poor have very low levels of non-renewable resource use (they have too few capital goods), very low levels of waste generation, low use of water, very low levels of greenhouse gas emissions - and a large section of the urban poor are engaged in activities which are important for resource conservation - for instance in the formal or informal 're-use, reclaim, recycle' business or in urban agriculture.

Local and municipal governments are of critical importance in their ability to help shape people's behaviour patterns in line with the demands of sustainable development by using appropriate forms of urban environmental management and planning. Alternatively, poor local government can be a strong factor in allowing the deterioration of the urban environment to continue. This is particularly true with authorities lack the professional and administrative capacity, and the financial resources, with which to carry out adequately many of the environmental management tasks which they need to perform. This is important. Cities do not have to be the locations of major environmental degradation, nor do they necessarily need to be 'parasitic' on other areas, as some writers would claim[1]. Rather, good management and planning of the urban environment can lead to major efficiencies in energy use, for instance, by altering the physical fabric of the city, in terms of residential densities, zoning of activities, provision of public transport, and so on. Similarly, building the capacities of local communities to identify environmental assets and problems is critical to building durable solutions, bringing local knowledge and commitment to bear in improving the urban environment. Local government has a role to play in this, as facilitator and enabler, avoiding the temptation to impose top-down, technocratic solutions, which experience shows too often tend to work only in the short-term, to be more expensive than other solutions, and to create unexpected adverse knock-on effects. Local government and decentralised state regulatory agencies also often have, or should have, a role in monitoring private sector

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Box 4.1: Different aspects of environment management for city authorities

Ensuring availability of infrastructure and services (both through public provision and setting framework for private and community provision) with water, sanitation, drainage, garbage collection and management, transport and protection and management of public space being particularly important;

Appropriate regulation and control of activities. Covers building codes that promote health and safety, planning norms and codes that ensure environmental aspects of land use, and regulations that influence the environmental performance of enterprises such as regulations on occupational health and safety, on gaseous and liquid emissions and on the generation and handling of solid wastes within enterprises. Inappropriate regulation needs to be avoided, as it can impose unnecessary costs in terms of money, time spent waiting, and social inequity.

Facilitation. Embracing provision for participation and the development of local agenda 21s plus the access to information that this implies for citizens.

Planning for the future. This includes measures to encourage appropriate development of unused land within built up areas, ensure the availability of land and infrastructure for urban developments (especially land in locations and at prices that meet local income groups needs), measures to prevent or limit urban sprawl, measures to limit hazards from disasters and measures to assess the environmental impact of new developments.

Incentives and penalties. May include greater emphasis on demand management - including incentives to encourage good practice in energy and water conservation and waste reduction; taxes and charges to limit private automobile use; removing subsidies and government controls which distort decisions towards environmentally damaging results.

Environmental aspects of public sector operations, including environmental audits of public policies and the operation of public agencies.

compliance with regulatory standards, for instance in air and water pollution, and the generation and disposal of solid wastes.

Central to the approach advocated here is that environmental management and planning requires a necessarily multi-disciplinary, multi-tooled approach, combining aspects such as land use planning, environmental assessment, information and education, targeted anti-poverty work, economic approaches (e.g. pricing and taxing) and administrative reform (from improving community engagement to well-regulated forms of privatization) (see Box 4.1). Allied to this is a concern that too often the effectiveness of local government has been limited, in terms of resource availability and also in terms of adherence to inappropriate models of urban management (often imported from the North), which were technocratic and exclusive, rather than inclusive in their attempts to plan for the urban majority. There is a compelling need to identify and work with processes which are more open, transparent and democratic, producing decisions which are widely accepted by all in the community.[2] As such this section is as much about improved governance as it is about specific techniques for environmental management and planning. It is also about much more than achieving localised environmental improvements: good environmental management and planning can help to address poverty issues and it can also help improve urban economic development. Urban economic health can benefit from productivity improvements (e.g. reduced congestion) also in creating a more attractive environment for new investment, based on good provision of environmental infrastructure (such as piped water and provision for sanitation and drainage) and creating a good quality living environment (e.g. Curitiba, Porto Alegre).

4.2 Techniques to promote environmental planning and management for city and municipal governments

Economic tools and regulatory systems for the urban environment

Recent years have seen a more subtle approach developing for balancing economic and regulatory approaches to improving the environment. Sanctions-based systems built around establishing common regulatory standards (e.g. setting effluent disposal limits) have a necessary role to play in changing environmental behaviour. However, used in isolation they have too often proved to be relatively costly, difficult to police and insensitive to local conditions. Important advances have been made in respect of locally-based systems of permits and licences, which can help maintain discharges within locally acceptable tolerance limits. In addition, there has been a growth of interest, mainly evident in the USA, in developing systems of tradable permits which allow trading of

pollution rights between firms within a well-established regulatory system for protecting regional environmental standards and gradually reducing pollution levels.[3] These provide a useful example of how to combine regulatory and market-based systems to bring about changes in behaviour. They are, however, only likely to be effective in systems with strong systems of regulatory control and market monitoring. There are, however, a range of other economic tools which can usefully be applied more generally alongside regulatory systems (regulatory systems are returned to here in section 4.3 on blending regulatory and market reform).

Properly devised and applied, economic tools can be an important part of bringing about positive environmental change by improving the market signals to consumers, firms and governments. They are particularly important where chronic market failures exist, particularly where substantial externality effects mean that inappropriate market prices are sending out perverse signals. A market externality in this sense is would typically involve environmental impacts which are incorporated into the formal pricing system, including most air pollution. Car taxes for instance will typically cover costs of road building, but not the indirect costs such as air and noise pollution, accidents and mortalities. Major efforts have been made in recent years to recover more of these 'hidden costs' and also to use pricing and taxation systems to send out market signals which steer behaviour towards more environmentally-friendly decisions. A typical exam is using taxation to introduce an increasing price differential between leaded and unleaded vehicle fuels to steer car manufacturers and consumers towards using unleaded fuel.

Moves towards full cost recovery and removing perverse subsidies are important in other areas too. For instance, though laudable in many ways as a social goal water subsidies have also had the unintended consequence of encouraging water profligacy. Many of the subsidies have also been found to be of most benefit to more prosperous communities, which are more likely to be linked to public water supplies and to consume larger amounts of water. Simply addressing such problems through changing pricing systems runs the risk of being socially regressive, however. As such it is important to introduce market, subsidy, and taxation reforms sensitively and in an integrated fashion to ensure that socially marginalised groups are not further disadvantaged by these reforms and indeed to ensure that they benefit most from them.

Other forms of economic tools include pollution charges and user charges, based on polluter and user pays principles. Pollution charges are typically levied by a state regulatory agency, with charges levied according to the scale, nature and intensity of pollution involved. Different countries tend to adopt different levels of charges, aiming to change behaviour patterns and to allow environmental remediation costs to be

covered, where appropriate.User charges are typically aimed at recovering the costs of running environmental services, for instance water supply, sewerage connections, road pricing, and refuse collection and disposal. Deposit refund systems can also be useful in fostering environmentally friendly behaviour. They can be applied in various ways, from bottle refunds to encouraging the collection and the possible recycling of tires, batteries, car oil, refrigerants.

Land use and strategic urban planning

Urban land use is largely the outcome of private decisions, influenced by actual or expected public interventions. Land use planning is an imprecise technique, blending prediction, facilitation, negotiation and prescription. The needs and capacities for land use planning vary enormously. Overly prescriptive land use planning, rarely adhered to in practice, helped give ambitious master plans a bad name. However, applied strategically, as a corrective device, land use planning can provide important environmental benefits ranging from better living environments to lower green house gas emissions.

Inappropriate land use contributes to the environmental health problems described in the previous Section. Residents' living environments are threatened when housing is far from potable water, near to waste dumps and polluting industries, or on flood prone or unstable land,. A good location is also critical to people's livelihoods. Land use planning that contributes to better residential location, and provides for housing security among low income groups, can go a long way towards creating the basis for healthy living environments.

When land use planning fails to provide adequately for residential development, low income households are often pushed to the periphery or to land that remains poorly controlled by owners and regulators. The resulting settlements tend to be environmentally fragile or even hazardous, difficult to service, and insecure. Insecure residents have little incentive to invest in environmental protection and improvement: they may not be around to reap the rewards. It is widely recognised that slum and squatter clearance are not the answer, and many cities have met considerable success providing low-income settlements with more legitimacy and access to better services. The costs of providing for poorly situated settlements are substantial, however. A small investment in facilitating more appropriate settlement patterns can yield considerable savings in the long run.

Spatial planning on the urban periphery

Urban sprawl has been a key feature of recent urban growth in the South, although a combination of inadequate public transport and relatively low levels of car ownership mean this is not as marked as in many cities in the North. But sprawl is nonetheless an important issue. For instance in Lima, Peru, whilst the population grew by two and a half time between 1969 and 1985, the built up area of the city increased by almost three and a half times.[4] Problems associated with the resultant low density peripheral development typically include: loss agricultural land, maximised need for infrastructure provision (greater lengths of roads, gas and water pipes, electricity lines, and so forth), poor location and layout of development, non-hierarchised roads, excessive public service standards and poor network layouts.[5]

The result of this type of development is excessive public funding requirements, inefficient use of public infrastructure and poor urban productivity, not least as the poor in the periphery become further disadvantaged by their distance from some of their basic needs (low density development does not support good public transport), including places of work, hospitals, and schools. It is usually speculators who have benefited from this peri-urban expansion rather than the original population. In many cities, landowners develop outlying sites in order to induce the authorities to build connecting infrastructure and create further opportunities for urban development in the intervening agricultural areas. Elsewhere, delays in infrastructure provision in transforming areas from rural to urban settlements most impact upon the poor who move out there and are less able to mobilise sufficient politician and financial resources to attract infrastructure provision. When linked with poor transport management, sprawl is a major contributing factor urban congestion problems, which in turns impacts adversely on urban productivity.

In environmental terms, low density residential development is generally more inefficient, in terms of energy insulation, requiring greater distances for basic journeys and promoting greater reliance on private cars, since low density development supports less in the way of public transport. For cities in the North, where access to cars is higher, low density cities typically generate twice as much carbon dioxide emissions as higher density cities[6] - though these results are not directly translatable to cities in the South, they do indicate the nature of the underlying problems. It needs to be emphasised that it is not a simple case of high density development good, low density development bad. Instead we need to be examining the overall mixture of densities provided for within a city, and the interspersion of residential with other land uses, including concentrations of employment and green space.

Mixed use planning and urban design policies

It is also possible to see a neglect of the inner city fabric in many cities, as the former emphasis on slum up-grading has been replaced and controls over market-led development relaxed. In consequence, some cities have witnessed a

diminished quality of their built environment. Simultaneously official policies to promote commercial and high density development have often served to physically exclude the urban poor and the informal jobs they rely on.[7] Those communities that are displaced are often re-housed on the urban periphery remote from their sources of livelihood. Apart from direct impact impacts in terms of residential land take-up, this adds to the environmental burden through additional travel demands, as well as imposing additional costs on the poor themselves. Planning mechanisms in the inner city areas, such as mixed use, mixed income development supported by cross subsidy and planning gain has a role to play here.

A mixed use approach to urban planning has a broader role to play. Where once the benefits of large scale zoning to separate industry from residential areas seemed self-evident, a combination of deindustrialisation, the cleaning up of industry and the imperatives of sustainable development have made the arguments more complex. The problem with separation of land uses is that where public transport is inadequate to cope with complex cross city journey patterns, it may promote greater car usage for those who can afford it, and greatly disadvantage the many who cannot. In addition, the trends towards cleaning up factory pollution, towards smaller factory sizes and towards service sector employment mean that the scale of the problems associated with industry may be diminishing in many cities, prompting a concern to move back towards mixed use zoning, allowing a greater interspersion at the local level of residential, employment, leisure, consumption, health care, and education activities. Caution needs to be expressed here, as it is often smaller firms which are precisely the most problematic sources of pollution in the cities of the South, so efforts to encourage such firms to be more integrated into the residential fabric require parallel efforts in pollution regulation and monitoring[8]. In addition, it would be naive to expect greater proximity of itself to promote a shift away from car use; rather it can be a useful ingredient in a broader ranging set of policy initiatives which include improved provision and coordination of public transport, and improved safety and access for cyclists and pedestrians. The use of local spatial strategies or urban design frameworks can help to ensure a positive approach to managing the public realm with a network of safe, high quality pedestrian and cycle routes connecting different parts of the city to one another directly or to nodes of the public transport system. Together with the shift away from exclusive zoning and, in addition to reducing commuting levels and car dependency, this type of approach to promoting connection can also help promote social cohesion through building stronger communities.[9]

Transport planning and management

As cities in the South have grown in both prosperity and size in recent years, so the problems associated with the car have risen. The transport sector accounts for a high and growing proportion of air pollution in cities in the South, creating considerable health problems as noted in earlier sections. As noted earlier, congestion is a related problem, adding to air pollution problems (noxious emissions and noise), disruption to local communities and reducing urban productivity levels. In Mexico City for instance, motor vehicles contribute 40% of air pollution, factories 30%, the rest mainly domestic waste.[10] In addition, fatality levels from accidents are much higher in countries in the South than in the North, with these differentials repeated for cities. Annual urban fatality rates for 10,000 vehicles stand at 11.6 in Bombay and 7.9 in Sao Paulo, compared to 2.2 in Chicago, 1.6 in New York and 1.1 in Tokyo. Many more of course are injured - in Sao Paulo for every fatality there are 22 injuries.[11] In general cities in the South suffer disproportionately in terms of accidents which affect pedestrians and cyclists as these are more common modes of transport in the poorer cities. Congestion is a related problem - the rush 'hour' in Seoul reportedly lasts 12 hours, in Rio de Janeiro 14 hours.[12]

By and large, the more prosperous the city, the more appropriate it will be to have economic policy tools to the fore, for instance in road pricing and petrol taxes. But even in prosperous cities economic instruments can only be part of the package of tools necessary to tame the automobile. In addition there needs to be an integration of land use and transport planning to reduce the need to travel long distances (see previous section), an integration of different modes of transport, including coordination of public transport to allow ready passenger transfer. Also important is regulation, for instance on emission standards or vehicle usage: this has been critical in Mexico City for instance, which has insisted on a clean-up of its vehicle stock, from insisting that all buses and taxis be gradually replaced by ones which run on unleaded petrol and installed with catalytic converters, whilst in 1999 the government insisted that the half of the taxis built before 1984 be replaced.[13] In addition to city-wide measures there will be a need to be localised efforts to control car usage, including speed restrictions, pedestrianisation, improvements for bicycle users and so on.

There are plenty of other ways in which urban transport can be addressed: many cities now have areas with pedestrian-only streets; Phnom Penh has introduced guarded bicycle parks at rail stations; in Harare City employees can get low cost loans to buy bikes and city centre traders are obliged to provide bike parking spaces; the Metroville programme in Karachi encourages people to build homes within walking distance of jobs and home-based workshops; in Manila fuel prices were virtually doubled in 1975, car taxes were increased and a light railway built - in the next ten years petrol consumption fell by 43% and travel time on roads decreased by a third.[14] There are also plenty of local policies which work against local environmental well-being, witness the attempts of the authorities in some Chinese cities to reduce

cycling in order to make roads clearer for cars and buses, and the prohibitions on small buses in some Indian cities. Perhaps the most successful approaches are those which focus on combining attempts to improve private and public transport in an integrated fashion (Box 4.2).

Box 4.2 Integrated approaches to traffic management: Singapore

Perhaps the most famous example of an integrated attempt to reduce transport problems comes from Singapore, which has used a combination of higher parking fees, park and ride, improved bus service, a mass rapid transit system, an attempt to promote staggered work hours, and area licensing. Under area licensing access to the CBD was restricted in the rush hour, requiring the purchase of daily or monthly passes, except for buses and car pools, which were exempted in an attempt to foster high vehicle occupancy levels. This combination of policies has had a major impact in reducing cars entering the restricted area, and in encouraging the use of public transport and car pooling.[15] In addition, all cars over three years old must undergo annual roadworthiness checks helping ensure high standards of mechanical and therefore energy efficiency[16] Interestingly, whilst a degree of displacement of businesses and to areas outside the cordon boundary might have been expected, in practice this has not occurred due to the benefits of the system in terms of reduced congestion, better environment and improved access by public transport.[17]

Preserving cultural heritage

Preserving urban cultural artifacts, as buildings, layout, parks or public monuments, is a vital part of maintaining the liveability of the city and also its potential for urban tourism, and with this economic development. In many senses it is useful to acknowledge that parts of the built environment of the city can in themselves constitute non-renewable resources, which need to be carefully preserved and handed on to future generations. The value of the cultural heritage of cities is multiple: aesthetic, as cultural artifacts in their own right, in creating and maintaining a sense of community, and as potential assets for the tourism sector.

Use of green space in urban areas

Provision of adequate green space is an issue which brings together concerns about residential density, zoning and access, and the need to manage the overall environment of the city. When well planned, urban green space can serve a number of inter-related functions: aesthetic, leisure, climate control, and preventing development in inappropriate locations. The first two of these are self-evident, but this does not mean their value should be underestimated. Green space as a means of climatic modification is important at various scales and in various ways. At the local level green space can provide a valuable buffer zone between areas, for instance roads and residential areas, helping reduce noise and

providing a visual screen. Recent US research indicates that well-positioned trees provide shade, wind-breaks and evapo-transpiration (lowering temperatures), creating savings of 20-25% of average annual residential energy costs for affected houses in the process, relative to similar houses in unprotected areas.[18]

In addition, plants and trees can play an important role in neutralising air, water and land pollution. Trees are particularly valuable in their ability to reduce air pollution, including absorbing sulphur dioxide and carbon oxides and releasing oxygen,[19] hence their frequent designation as the 'green lungs' of the city. Urban forests have even been used successfully to treat sewerage in the US. Increased greenery can also help reduce urban temperatures, by absorbing and metabolising solar energy. By contrast, hard surfaces tend to absorb the sun's heat and radiate it out. Taken in combination with the impacts of imported energy (e.g. for cars and buildings), this can lead to a substantial urban heat island effect.[20] The additional heat can be a major contributor to discomfort, exhaustion and ill-health, and can also lead to increased energy consumption, in particular in respect of the need for refrigeration and air conditioning. Used creatively, public provision of open space can also be used to move development away from areas of high natural risk, such as unstable hill slopes or vulnerable flood plains which have attracted squatter settlements (see Box 4.3). It is also worth reflecting that provision and maintenance of urban open space is largely a public responsibility, unlike housing and transport provision, so strong local authority capacity in this area is usually essential.

Box 4.3 Risk reduction and environmental improvement: ecoparks in Manizales

The municipality of Manizales (Colombia) has created a series of eco-parks where development is severely restricted, aiming to control expansion of the built up area and to prevent construction in areas of high risk from landslides. Linked to this programme, owners of buildings in high risk areas were offered land-exchanges to allow them to move to safer areas.[21]

Urban Agriculture and Forestry

A related theme is that of urban agriculture and forestery, typically a victim of exclusionary land use zoning systems, regarded by too many city managers as a symbol of backwardness and a low value urban land use[22]. Yet there is much to be said in favour of both agriculture and forestry. It combines many of the aesthetic and environmental benefits of green space noted above with the ability to produce food, fuel and building materials locally. This can encourage greater self-provisioning for the poor, local composting (and linked to this reduced need for landfill sites), beneficial conversion of sewerage, stewardship of the land, community building and a healthy diet, and reduces the need to import food from

distant sources, with all the related energy costs and loss of freshness in the food. Urban agriculture, in many places, remains more important in economic terms than is generally imagined, with two out of three urban families in Kenya and Tanzania reportedly engaged in this type of activity.[23] It can also provide a productive means of using urban waste water, where organic wastes are used as fertiliser. Whether in farms, marginal areas, allotments or back gardens, urban agriculture and forestry merits close attention as an integrated approach towards reducing urban poverty and improving the environment.

If these are the positive effects, then it is important to recognise the need to regulate for less desirable impacts. These can include contaminated food (e.g. through high lead exposure), zoonoses and vector borne diseases such as malaria. There are particular problems associated with livestock in particular noise, smells, and contaminated run-off into urban water supplies. Whilst much of the development literature tends to stress the potential value of urban agriculture, local authorities are often less convinced precisely because of an awareness of such problems and a lack of clear guidance about how it might be possible to overcome them.

Integrated approaches to urban management

Valuable though each of these tools is when viewed in isolation, unless they are adopted in an integrated, cross-sectoral way they will never achieve their true potential impacts. It is also important to ensure that plans are not imposed in a top-down, technocratic way. Local participation is essential to ensure success in any policy domain. As such it is important to use the land use planning system creatively to meet local needs in light of local circumstances, not as a form of imported blueprint for urban layout and design. Central to its concerns need to be the provision of adequate land in accessible locations for the poor, an integration with transport planning and economic development policies, and an open, participative approach to community and business engagement. An example of such an approach which is commonly cited comes from Curitiba in Brazil (See Box 4.4).

In addition, planning powers need to be respected both locally and internationally. In some cases the types of urban master plans produced in the 1960s and 1970s were overly ambitious and under-resourced, and too often imposed from above as a form of technical exercise. It is little wonder that they were widely flouted, particularly given the widespread problems of effective local government and public participation mechanisms at the time. But now as technical expertise and consultation systems have improved, and the political will to enforce plans become stronger, it is important to pay more attention to them: yet the pattern remains that locally produced plans have been ignored by the external funders on whom most development is reliant, including donor agencies more keen to make sure that projects meet

Box 4.4: Linking land use and transport planning: Curitiba, Brazil

Curitiba is a city of 2.5 million people. It has developed a sophisticated, integrated bus system involving exclusive bus lanes has been developed along five main axes of the city. Stops are provided every 400 metres, with pre-payment facilities provided to ensure rapid entry and limited congestion.

In total the city's mass transport system copes with 1.2m passengers a day, and though it has the highest density of cars of all state capitals many car owners prefer to use public transport. It is important that improved public transport has been linked to policies to promote higher density residential and commercial development at nodes along the main axes, requiring a programme of land purchase and rigorously enforced zoning. The resultant reductions in car usage has generated fuel savings of up to 25%.[24] In addition, accident levels have fallen. A further feature of the Curitiba approach is its integration with social policy, with fare deliberately kept low, whilst 17,000 homes for those on low income have been developed close to the system.

their own organisational criteria rather than locally agreed land use priorities.[25] A greater spirit of mutual compromise is perhaps required. Efforts to support and respect locally produced plans which are rooted in strong systems for popular participation will almost always bring rewards for citizens, local government, business investors, and donor agencies.

Site planning, material use and building design

The environmental health burdens described in Section 3, while not always topmost in people's minds, are usually closely tied to local concerns. Many of the worst threats are not just unhealthy, but unpleasant and burdensome as well. Teary eyes during cooking is considered one of the best indicators of poor air quality in the home. Distant water sources, requiring arduous water haulage, is among the best indicators of poor environmental hygiene in the home. Long queues at public toilets is among the best indicators of unhealthy sanitary conditions. A better built environment, informed by health concerns but led by local priorities, can help provide residents with the capacity to improve environmental health.

It is important to emphasise that attention to environmental considerations in site and building design can reduce costs at both the individual and the collective levels, although some of these savings may only become evident in the medium to long-term. For instance in building design, building with rather than against nature can produce some major savings - simply aligning housing to maximise solar capture and shade at appropriate times of the day can do much to improve the comfort of a house, factory or office whilst minimising the need for extra heating, lighting or air conditioning.
Good design would also reflect on internal layout to minimise safety hazards, provide possibilities for beneficial usages, such

as courtyards for wind protection and to stimulate communal activities, and the provision of facilities for recycling, composting and even solar energy panels. Some of this might seem like stating the obvious, until we consider previous fashions for buildings where air conditioning replaced opening windows in office buildings, and for large car parks rather than cycle sheds and nearby public transport facilities. As earlier sections on the health hazards in the home emphasised, attention also needs to be paid to safe cooking facilities, sanitation, and ventilation. These are often key areas for improving environmental health and ones which are central to the daily experience of poor communities, especially those people who spend long periods in the home. Full local consultation on how to best deal with these concerns in light of local conditions, resources and experience is therefore essential.

Use of local or recycled building materials can reduce the need for expensively imported materials, whilst an emphasis on natural building materials rather than manufactured products is usually desirable, since products such as bricks and laminates have high embodied energy values.[26] Domestic and public landscaping can be fashioned to help create more porous landscapes, reducing the need for expensive artificial systems for stormwater runoff, and indeed reducing the likelihood of damage and pollution associated with stormwater.

It is important to emphasise the positive advantages to be gained from local community organisations in planning, designing and indeed building their own homes. Local people are more likely to be aware of local issues, for instance the need to protect against wind at certain times of the year, or the seasonal importance of shade and passive solar capture. Similarly, putting power into the hands of residents ensures that plans will be sensitive to the need for using methods for quick and easy construction, with some flexibility to alter living spaces to meet changing household circumstances. Imposed, system-built higher density housing by contrast tends to use materials which are less readily available and less amenable to conversions.[27]

One of the main problems facing those trying to implement change which is sensitive to local conditions is often the inherited legacy of environmental and building controls which are frequently argued to establish unrealistically high standards. These inappropriate building and neighbourhood standards sometimes reflect the views of former colonial administrations or a preference for particular types of modern building material or construction techniques over traditional ones.[28] In some cities two planning regimes persist side by side, one for the indigenous and expatriate elite, and one for the rest of the people, with different approaches to residential densities often symbolising this divide, as the former retain regulations insisting on high minimum plot size (and therefore low densities).[29] As in countries such as Australia, there is a

need to develop policies which retain important aspects of the built environment as historical artifact, yet which encourage appropriate forms of infill and higher density development which better utilize the existing urban infrastructure.[30] In some instances this may require a re-education of local politicians about the value of moving towards higher density and mixed use developments in the context of sustainable development.

Managing solid, gaseous and liquid wastes

Safe disposal of wastes is essential to countering many of the problems outlined in earlier sections. This requires a considerable degree of regulation backed by a will to ensure enforcement of the set standards. However there can be considerable flexibility about how standards are established, and also in terms of how responsibilities are allocated, for instance whether municipal waste collection is done by public bodies or contracted out to private operators. This issue is dealt with in greater detail in section 4.3 below.

Environmental thinking in this sphere tends to emphasise the importance to waste management of minimising the use of non-renewable resources and judicious stewardship over renewable resources. Resource profligacy is linked to degradation of the environment somewhere, whether it is local or distant, and almost invariably results in unnecessarily high and damaging levels of waste streams, be it pollution of air, land or water, or the disposal of the solid wastes of the city. In general, environmentalists advocate a four stage hierarchy for addressing this issue, with the preferred option being to reduce our consumption levels: reduce, reuse, repair and recycle. In cities where waste handling is deficient, measures which re-orient the waste cycle so as to limit high exposure situations also deserve attention.

Reduction measures can come in many forms. Particularly important are process oriented solutions which aim at reducing pollution problems at source through integrating resource and waste minimization characteristics into project design. Increasing the efficiency of manufacturing systems for instance, can radically reduce the need for basic raw materials, energy and water. Similarly, introducing low and non-waste technologies can reduce pollution at source. This has the added advantage of shifting away from expensive, often imported, end-of-pipe clean-up technologies. This life cycle approach is central to current attempts to address pollution problems, directing policy attention to addressing the causes of problems rather than simply the consequences. Many examples exist now of how a switchover to more environmentally benign processes can save money and even encourage producers to see what waste products as potentially recoverable and convertible into worthwhile commodities in their own right. The same philosophy can be seen in consumer markets too, seeking to reduce consumer packaging for instance. Linked into this philosophy are attempts to reduce built in obsolescence for products and

services, particularly evident in fashion goods, and to improve their longevity.

Reuse, repair and recycling are generally of descending environmental efficiency, with recycling at the bottom of the pile because of the (energy and labour) costs of conversion - comparing return deposits and glass recycling gives a sense of the difference. There are considerable economic returns to be had from these sectors too - interestingly enough recycling tends to create jobs more for highly capitalised companies, which are therefore more likely to be externally owned, whilst repair tends to operate closer to the craft sector based on small businesses.

Sorting wastes to maximise reuse, repair and recycling potential is a potentially labour intensive process and in many cities many people's livelihood depends on these occupations. The degree of formalisation into the economy varies, from informal sector waste scavengers to local government and NGO initiatives to support workers in collecting, sorting, selling and composting[31] municipal wastes: it is usually the informal sector which dominates in employment terms. Reuse and recycling can create considerable numbers of jobs, around 30-50,000 in Bogotá for instance, can help reduce the demand for energy, imported raw materials, and foreign exchange.[32] As cities become more prosperous the waste per capita tends to increase in both quantity, and also in terms of the potentially recyclable products sent for disposal, creating greater possibilities for introducing initiatives to improve productivity and working standards. Collection and disposal of solid wastes is also important since for some local governments, with limited other responsibilities, it can account for as much as 50% of their budget.[33] A considerable number of initiatives exist in this field which illustrate both the problems and the potential for actions which promote jobs, reduce wastes and develop re-use and recycling opportunities.[34]

In cities where a large part of the domestic waste remains uncollected, and human waste is one of the major pollutants, community-level solid waste management plays an important role. The residential environment suffers when the waste is washed in the drainage system, burned in residential areas, or left to decompose and provides a breeding ground for pests. Similarly uncollected wastes can create major health hazards in their own right and also block drains. As such an efficient municipal collection and disposal system, whether in the private or public sector, is essential to urban environmental well-being. A well organised community can begin to address many of these problems, particularly where there is a good working relationship with local authorities. Similarly, recycling is greatly facilitated when households separate their waste, again provided the recycling system can accommodate this. Separation at an early stage can reduce the burden on the waste-disposal system, and in many cities actually provides a source of additional income for the waste generating households.

Improving Urban infrastructure

One of the key problems facing most poor cities is the inadequate provision and unequal access to basic urban infrastructure, in particular access to public supplies of water. This directly contributes to the prevalence of health problems which are so prominent among the environmental problems of the poorest cities. As such there is an urgent need to up-grade the provision of basic infrastructure, in particular water supply, sewerage connections, and electricity. Similarly, improvements to public transport infrastructure can have a major impact on reducing urban environmental problems. Initiatives needed to be targeted towards preventative measures rather than measures for mitigating the effects. In the medium-term efforts to reduce exposure to diseases and their spread are of enormous importance and reduce the demand for clinic and hospital treatment. This links to other concerns to ensure that public infrastructure investments are well-maintained so as to ensure that investments are effective in achieving their goals, targeting investment towards those in greatest need, and ensuring that investments are put to effective use. The importance of this becomes particularly clear when we consider demand management issues in the next sub-section.

Demand-side management and supply-side improvement

Linked to the theme of waste reduction is the whole theme of demand management, which has rapidly risen up the policy agenda in recent years. The essence of this approach is to shift away from the 'supply fix' culture which once dominated urban infrastructure provision, with its focus on using advanced technological methods to address supply concerns. In water supply, looking to large scale dams and water transfers, in transport building large scale highway systems in anticipation of rising demand. Although sometimes still appropriate, current thinking emphasises the importance of exploring alternatives first, before engaging in costly new infrastructure, whether it be imported state of the art technology or small scale local solutions.[35] Central to this approach is demand management, which seeks to find a range of administrative and technical solutions which can help reduce the need for major capital investments in supply infrastructure. This can be achieved in various ways, including reducing demand at source (for instance reducing demand for new roads by improving public transport and policies for restricting car usage, introducing systems which are more efficient in their use of, for instance, water and electricity) and by making existing capital investments work more effectively - for instance repairs to water supply.

In the North the emphasis in demand management is often to ensure that new supply infrastructure is built only when absolutely necessary and all alternatives have been explored. Typical is work on Least Cost Utility Planning in parts of the US electricity sector, which insists that new capacity is only

built when all feasible alternatives have been undertaken, for instance education and information campaigns to encourage energy efficiency. Another example is the role of free retrofitting more water efficient cisterns for toilets, which can be cheaper in overall terms to water companies than investing in new reservoir capacity. In the context of the South, where infrastructure under-provision is still commonplace, the role of demand management is not so much in minimising investment in new infrastructure as in ensuring that existing infrastructure is used efficiently so that network expansions cater for new connections, rather than compensate for system inefficiency. Central to this is a fundamental rethinking of the way in which administrative systems can impede improving the number of people connected to basic infrastructure systems and improving their quality.

With respect to water supply for cities in the South, demand management approaches can help low income households obtain connections which they might not otherwise be able to afford, and to use the water more effectively to protect their health. In other words it can improve the impact of water, by paying attention to how water is used. For example, connection procedures and payments tailored to the needs of low income settlements can reduce the burdens of cost recovery policies. Negotiating with resident groups can help identify the best means of providing water. Also valuable would be assistance to develop in-house storage systems that will not allow dengue bearing mosquitoes to breed or the water to become faecally contaminated. Similarly, hygiene education can help household make the best use of the water they do have access to. In other words, supply does not stop with the provision of pipes and taps - it should also embrace the ways in which services are used and paid for.

In the energy sector, demand management can take the form of offering consumers (or settlements) a range of demand side electricity options, including for example pre-payment meters, boards containing the circuitry for households whom house-wiring would be prohibitive, or the possibility of paying capital costs (potentially for electric stoves) through the electricity charges. To the extent that urban consumers switch from smoky fuels, environmental health should be improved and, depending upon the local energy system, the broader environmental impacts as well. In relation to solid waste, demand management possibilities range from improved storage systems, both for households and communities, to systems to promote recycling.

What should be clear is that demand management and related approaches are not simply about resource conservation, but involve a fundamental critique of inappropriate supply driven strategies which fail to deliver appropriate, efficient and good quality services at the lowest possible cost. The important point here is that work on improving system efficiency needs to parallel work on extending system capacity - even though the former is not

usually as good as the latter at providing photo and plaque placing opportunities for politicians and financiers.

4.3 Making the most of local capacity: bringing partners together and blending regulatory and market reform

Partnership is essential to improving the processes of urban environmental management and planning. This section begins with a brief overview of the main partners in achieving urban environmental improvement. As a subsequent sections deals in detail with aspects of good governance, the main focus here is on the role of NGOs. Recognising that different partners and different professions have different historical traditions and different policy tools, the analysis then moves on to focus on some of the challenges which arise from the new governance systems which are emerging, particularly the redefinition of appropriate roles between public and private sectors, in terms of service provision and regulatory reform in the context of privatisation in particular. Partnerships can also be important in relation to improving urban management and planning processes (see section 4.3) and also in establishing non-statutory agreements over environmental objectives, for instance good neighbour agreements between businesses and local communities, voluntary target setting for pollution reduction, and business clubs which aim to swop best environmental practice.

Municipal governments have a crucial role in helping shape people's behaviour patterns by using appropriate forms of urban environmental management and planning. Cities do not have to be the locations of major environmental degradation, nor necessarily 'parasitic' on other areas. Rather, as we have already seen, good environmental management and planning can lead to major efficiencies in resource use. For instance, energy efficiency can be enhanced by altering the physical fabric of the city in terms of residential densities, zoning of activities and provision of public transport. Similarly, building the capacities of local communities to identify environmental assets and problems is critical to building durable solutions, bringing local knowledge and commitment to bear in improving the urban environment. Local government has a role to play in this, facilitator and enabler. It also has a critical role in providing key urban services, either directly or through ensuring coordination of provision by other service providers. Local government and decentralised state regulatory agencies also have a role in monitoring private sector compliance with regulatory standards, for instance in air and water pollution, and the generation and disposal of solid wastes.

Regional and National governments must also occupy a central role in devising and implementing policies for the urban environment, particularly in respect of their ability to introduce economic tools for improving the environment and in establishing and applying appropriate regulatory standards.

The role of regional and national governments is particularly important in respect of addressing the regional impacts of urban areas, in particular in ensuring that urban areas do not seek to reduce their costs simply by passing on their environmental costs to hinterland areas without adequate compensation, for instance in respect of appropriating distant water supplies without paying attention to possible urban-based solutions, such as demand management measures.

Potential roles for NGOs

As stressed in much of this document, in many urban areas, there is a strong role in urban environmental management and planning for NGOs, working both separately and alongside some of the expert advisors, municipal managers, and private sector investors, on whom work in this field necessarily in part relies. National and international NGOs can bring invaluable technical and financial assistance which can help to improve local capacity for environmental management and planning. Local NGOs can bring valuable resources in terms of mobilising local expertise, developing local legitimacy for projects and improving local ownership, and inputting knowledge of local conditions, local needs and local priorities, all essential ingredients for long term success in any project, programme or plan.

Particularly over the past twenty years, NGOs have also begun to play an increasing role as service delivery agencies, not least as local government has struggled to keep pace with the demands placed on them, in the context of fiscal constraints and growing populations. In most cities, there are a range of NGOs which provide some environmental services; in some urban areas and sectors, NGOs are major service providers. There are worries about accountability for many NGOs (and whether they do respond to the needs and priorities of low income groups) and about how services can be sustained, if NGO provision is reliant on external funding sources. However, some NGOs have demonstrated a long term capacity both to work in real partnerships with urban poor groups and to sustain themselves - for instance the initiatives supported by Pakistan NGO Orangi Pilot Project, and the water and sanitation system installed in Barrio San Jorge in Buenos Aires. In some, there have been successful combinations of international agencies and local community organizations - as in the community-managed infrastructure and services in the former squatter settlement of *El Mesquital* in Guatemala City. Some NGOs working on solid waste work with informal waste pickers and seek to support the waste pickers negotiating a fairer deal from municipal authorities - as in the case of the waste pickers in Payatas in Quezon City.[36] There is obvious potential for local governments developing partnerships with NGOs and community based organizations (CBOs) - although this is often difficult in that the reason why the NGOs and CBOs developed autonomous initiatives was because the local authorities refused to meet their obligations.

In terms of environmental management a key role for NGOs is in monitoring the state of the local environment. This is not particular to the South - in the USA lack of personnel in the key regulatory agencies means that there is considerable reliance on voluntary bodies to monitor local conditions as part of the regulatory enforcement process. At a more general level of monitoring environmental changes, local NGOs often have important roles in raising issues of environmental degradation or loss of amenities and in mobilizing populations to address these - see for instance the fight in Chimbote (Peru) to save a park, protect the wetlands and halt the pollution of the adjoining bay.

However, donors who work with NGOs also know that they can be as unaccountable and top down to the low income groups as government and international agencies. Unlike elected local authorities, they may have no mechanism for ensuring local representation or accountability. As a recent World Development Report notes, "Some NGOs are created opportunistically to advance the interests of narrow and privileged constituencies, often at the expense of the less vocal and less powerful."[37] National and international NGOs can bring their own agendas for 'best practice' environmental management, subverting local systems and priorities. Local NGOs may become too close to some of their intended beneficiaries and the local political process, becoming in effect captured by the agendas of vested interest groups, making it even more difficult for those outside this orbit to get their voices heard. There are practical problems too for NGOs in the face of the current policy emphasis to promote their work. For smaller organisations, rapid growth and ties to donor funding can create problems of coping with change and coping with expanded areas of expected activity. For larger NGOs, the necessary bureaucracy to keep them functioning can stifle their potential for innovation and reduce their sensitivity to grassroots pressures.[38] Although NGOs are generally an invaluable part of the local participative scene and need to be encouraged and nurtured, it is also important to recognise their limits, and to ensure that changes in their capacity and range of activities are nurtured carefully rather than imposed in a rush with too high expectations and too little in the way of resources.

Private sector capacity can also usefully be drawn upon in a variety of ways. Working with the private sector can bring advantages in terms of levering in financial resources, creating complementarities between different development projects, and also drawing on private sector vision and management expertise in terms of delivering key urban services. The growing trend towards private involvement in providing key services is particularly important in this respect and is a theme which we return to below in greater detail. In addition, it is important to emphasise that partnerships between government agencies, regulators, NGOs, communities and busnienesses on measures for improving resource conservation and pollution prevention at source can often be more effective than simply enforcing regulatory standards.

Blending regulatory and market reform: getting the best out of the private sector (and individuals)

A central challenge for cities in the South in the immediate future is to find appropriate ways to combine regulatory and market reforms. This is important because of the growing recognition of the potential for utilising private sector expertise and financial resources in managing basic urban services, for instance in waste management and water supply. The other contextual issue which is important to emphasise is the frequent failure of public monopolies to service poor areas effectively, through varying combinations of inadequate financing, poor management, poor focus on meeting customers demands and, in some cases, political corruption. A central advantage of well-regulated privatization is in opening up public service provision to competition. The attention to cost reduction and more efficient system management usually generates some cost savings, which can help to reduce or eliminate costly public subsidies. Attention to cost efficiency also means that investment and subsidies can be more closely targeted to where they can attain maximum improvement to services, rather than in the vainglorious prestige projects which too often dominated in the past, using the best but not necessarily the most locally appropriate technologies available.

Privatization can also be valuable in beginning to separate out the roles of service provider and regulator. Where both functions are held within the state then regulatory functions tend to work poorly, subject to political pressures to reduce their vigilance against other parts of the public sector. The important point here is the importance of independence for key regulatory agencies, an issue which privatization often helps bring to the fore. Poor regulatory institutions are often as much of a problem where public sector service delivery dominates as they are where privatization is the rule.

Experience both in the South and the North suggests that market liberalisation without appropriate and effective regulatory systems can lead to major problems. Of especial concern is the tendency in some cases for privatised service provision to focus on richer areas, best able to afford their services, whilst neglecting poorer areas. This has obvious disadvantages in terms of direct provision of services. It also can have important deleterious consequences in terms of overall system management, removing the possibilities for beneficial cross-subsidisation which exists when poor and rich areas are part of the same service supply system. A related concern is that a central feature of most privatisations is a shift from state subsidy of a service to full cost recovery. Although in environmental terms this has many advantages, in terms of the arguments about cost transference in section 4.1, when insensitively applied full cost recovery can have major adverse impacts on the poor who struggle to afford the higher priced water, electricity or transport. The argument here is not against subsidy, but for a shift from open-ended system wide subsidies in favour of more clearly targeted subsidies aimed at those households and communities most in need.

Regulatory controls are important then in various respects, whether service provision is public, private or mixed delivery. They need to encompass who gets access to services and under what conditions, promote a shift towards full cost recovery without penalising the poor excessively, introduce systems which link charges accurately to the levels of service or pollution, set appropriate minimum standards of service provision and protect the environment. There is an important issue here in terms of how environmental standards are set. In effect there are two dominant models, which though they have different underlying rationales are not necessarily mutually exclusive. Taking the example of sewerage, it might be possible to set standards according to the condition of actual discharges as one model (common in the USA and Germany), or alternatively to set standards in the receiving environment (the UK approach). The advantage of the former is in setting clear minimum standards for all, whilst the advantage of the latter is the flexibility it allows to adjust treatment standards to reflect the local abilities of the receiving media to naturally absorb and neutralise wastes. Costs in the first model tend to be higher, and risks lower. Whilst costs in the second model are lower it requires first rate monitoring systems to ensure standards are not breached.

Establishing minimum standards is only one way for reaching appropriate environmental standards. The other is to ensure market signals are working effectively, involving calculations of true life cycle costs of all options, linked to full cost recovery pricing, polluter and consumer pays taxation systems, and licensing permits (including the possibility of traded licences for pollutants). The essential point being made here is that regulatory systems (including land use planning, pollution control, traffic measures) and market systems are each on their own likely to be ineffective, almost inevitably leading to creative approaches by individuals and businesses seeking to undermine their effectiveness. What is required in all cases is a flexible integration of regulatory standards with market tools, with all sectors of activity and their policy tools recognised as being necessarily inter-related. The combination of tools can then begin to creatively change behaviour patterns by a mixture of inducement and sanction.

Linked into this is the issue of privatization. The benefits of this approach are widely cited as improved investment and sensitivity to customer demands, plus a reduced demand on public spending as operators invest in improving their own efficiency and seek to institute forms of pricing which allow full cost recovery. This can work well: for instance the rise in private sector operated small buses has been successful in extending services and generating profits in many cities, for

instance Hong Kong, Buenos Aires, Cairo and throughout Cameroon. In Calcutta, whilst state buses which operate on the best roads receive subsidies of US$1m a month, privately operated buses operate without subsidy, possibly owing to their greater willingness to make repairs, collect fares and improve both capital and worker productivity[39]. However, as intimated in the case of waste management, privatization is no necessary panacea: if poorly regulated it can have negative impacts, not least in terms of raising costs of services beyond the reach of the poor, reducing cross-subsidies between rich and poor, and reducing the extent of provision of services. For instance, liberalising bus fares and routes in Santiago had the effect of more than doubling the numbers of buses and taxi buses. However fares rose rapidly too, leading to a downturn in patronage. As a consequence fares as a percentage of the monthly minimum wage rose from 9% to 21% between 1982 and 1988. A combination of more buses and higher fares have left considerable under-utilization of capacity - whilst many people are now forced to walk to work.[40] Privatisation of solid waste management (including street cleaning, collection, disposal) also raises some interesting issues. Increasingly common in Asian cities, including Kuala Lumpur, Seoul, and Jakarta, whilst there is strong evidence of cost savings there is as yet little evidence to suggest that it has resulted in service provision being extended to areas not previously serviced. In a similar vein, there are strong concerns that the focus of privatised provision on rich areas has not always been beneficial, in some cases requiring government subsidy and in effect reversing patterns of subsidy, where poor areas come to be effectively subsidising richer areas.[41]

This is not to argue against privatization policies rather to point out the need for them to be set within a context of appropriate regulatory systems. In the case of buses, for instance, it is possible to privatise the operation of services whilst still planning and regulating the network and programming of services. Both Curitiba and London have done this, reducing the or eliminating public subsidies whilst maintaining reasonable service levels, and avoiding the cherry-picking and over-servicing noted in the previous paragraph.

4.4 Information, participation and decision-making processes

Information is central to good environmental management and planning. Critical to this is *access* to information. This section highlights some of the key components of information systems usually associated with environmental assessment. It begins with some of the techniques more commonly associated with external technical expertise and moves on to initiatives which place much more emphasis on the role of the community in understanding the environment. The list is not intended to be inclusive of all approaches, since many of the techniques used in social planning, community action plans,

needs audits and so on, could also usefully be applied in the environmental field. It is, however, intended as a summary of the main approaches to be found in environmental management and planning - albeit recognising that this field necessarily increasingly intersects with other sectors of activity.

The overall thrust of the argument here is that though there is an important role for the technical expert in identify environmental issues and approaches, these must not usurp or undermine the role of community bodies. More than this, it is important that information is made widely available to all, not captured by those who commission pieces of research, or by a technocratic capture of information by dint of its poor presentation for interpretation by ordinary citizens. Alternatively, this imperative for openness and transparency should not be used to generate only superficial information - the need is rather to work with communities to enhance their role in collecting, collating and analysing complex bodies of information.

The reason for this emphasis on information and access is two-fold. First, poor information on the environment leads to poor decision-making by all, state bodies, individuals, communities and businesses. Secondly, unequal access to information can be used by powerful groups in society to further undermine the less powerful. Whilst information access alone cannot overcome embedded asymmetries of power, it can be an important factor in trying to redress them. A central concern here is that those who have preferential access to environmental information and understanding can yield it to their own advantage. As an example, Fuks demonstrates how emergent environmental consciousness in Rio de Janeiro, Brazil, has been used by certain organisations to argue their position in key conflicts with authorities. But both environmental groups and low income groups are reportedly little involved as yet in these new forms of protest mobilisations. Environmental groups tend to be poorly organised, whilst low income groups may lack information and not perceive environmental damage as well as having limited organizational resources.[42] So whilst middle and high income groups have mobilised well defensively against environmental damage, other groups have not. The net effect is likely to be a form of displacement in some cases at least, from areas of opposition to areas of non-awareness or low concern.

This clearly resonates with US debates on environmental racism[43], as concern has grown about the systematic pattern toxic facilities being located in poorer rather than richer neighbourhoods in the city. The usual reasons given for this pattern include that poorer areas may lack the resources to resist the location of such facilities, are so poor that they feel obliged to accept them for the jobs create, or possibly as poor people can only afford to live in houses where noxious facilities already exist, depressing land, housing and rental

values. The reverse side of this is that richer areas can use land use planning restrictions to ensure that their areas are not considered for possible location, zoning out industry in the same way that residential densities can be set to exclude the kinds of higher density developments in which the poor typically live. The space of the city is not neutral then, nor are the participative systems which are used to deepen or consolidate divisions within the city between rich and poor.

Several key issues emerge from this discussion. Poorer communities need access to information and knowledge if they are to be able to lobby effectively against decisions which adversely impact on them. All communities need access to information if they are to be able to influence the decision-making behaviour of state and private sector decision-makers. And a reminder that local participation on its own is no panacea: it needs to be linked into broader democratic systems, and local considerations need to be set against wider regional and national considerations. Otherwise we might end up with a lot of very successful local participation processes systems all agreeing that they did not want to host locally unwanted land uses (LULUs). This tends to leave us in a situation where poorer communities still end up with disproportionate exposure to LULUs, as they are effectively bought off by the prospect of jobs and any offers of local compensation deals. Information needs to be used to help resolve difficult issues, not to turn away from them.

Environmental impact assessment (EIA) is perhaps the most well-known tool in the environmental assessment repertoire.[44] Typically, an EIA is an independently conducted study commissioned to examine the likely impacts of a project proposal. It will seek to identify the key environmental conditions of a site (covering the natural environment, built environment, and human impacts), to assess key aspects of damage likely to result from a proposed development, including assessing alternative ways for diminishing adverse impacts. Social impacts are frequently found in EIAs, attempting in particular to look at the distributional impacts of costs and benefits. A non-technical summary is also usually provided along with an assessment of how a project links to existing environmental and land use regulatory systems. A well-conceived and conducted EIA can be an important tool in deciding whether or not to allow a major project to go ahead. Because of the financial costs and the time delays involved in undertaking an EIA the procedure tends to be used sparingly.

In recognition of the limits of a site-based approach to environmental impacts, in recent years there has been a growth of interest in *strategic* environmental impact assessment procedures. These typically embrace a suite of projects or even a particular policy or plan (from an urban ring road, to local land use or national transport plans). This approach has the advantage of addressing concerns about the additive effect of a number of projects on local carrying capacities (see below). As with EIA generally, in the context of the South, EIA procedures need to be established which combine the virtues of simplicity, low cost, speed, flexibility, incorruptibility and ability to make a difference to political decision-making.[45]

A related theme of work in recent years has been the development of *capacity studies.* These range widely in type and scope. For instance, in Britain, work has focused on urban capacity studies to examine the potential of regions to absorb more housing without irreversible damage to strategically important aspects of the environment. But capacity studies can be used more widely in forward planning processes to attempt to gauge the scope for introducing new forms of human activity to an area - for instance a new industrial estate. In this sense they are very much akin to strategic environmental impact assessments, but with a greater concern for mapping out the quality a local environment and its carrying capacity. That is to what extent it is possible to harness nature's abilities to provide resources, provide key services (for instance the protective ozone layer) and act as a sink for wastes, without damaging the overall integrity of its function and ability to continue to replenish itself.[46] In effect capacity studies attempt to identify when an area has reached its environmental limits, involving a range of technical, cultural and economic judgements.

A key role for capacity studies is using the identification of critical and non-critical natural stocks. This debate moves beyond concerns with differentiating between renewable and non-renewable resources to a more focused attention to looking in resources in their local context and at possibilities for resource substitution. In this approach there is a recognition that the value of a natural resource is not fixed and that it may depend at least in part on local context. For instance, preserving a particular stock of plant may be locally important where it is scarce and possibilities for moving to alternative locations are limited - alternatively, the same plant may be commonplace in another location, and the removal of one part of its habitat would in no way impact on the overall survival of the species in that place. So a capacity study would examine critical (not readily replaceable or substitutable) capital stocks, and attempt to define these in terms of both the overall resource environment, and their regional and local context. Another example might help to bring out the issues involved. A park in the middle of the city, or a field on the edge of a town, may have a particular natural and social value over and above that which a similar area of land might have in a rural area surrounded by similar land, simply because it is locally in short supply, as both a natural asset in its own right, but also in terms of its higher 'marginal value' to humans who wish to keep it for leisure, 'green lung', aesthetic or other reasons.

Environmental audit procedures are also increasingly common in large organisations such as businesses, universities and local

government. They are usually conducted at the level of the whole organisation, assessing internal procedures, including purchasing policies, against desirable policies for sustainable development - for instance they might look at use of energy efficiency devices, systems for waste minimisation, and use of recycled paper. More ambitious audits would also question corporate policies, for instance the use of company cars, car parking provision, and the possibilities of providing more spaces for cycles and travel allowances for those using bikes rather than cars. Much the same procedures can be applied to domestic dwellings. though more typical is the more focused use of energy audits to identify the potential for domestic energy savings, linked to grants for improving energy efficiency.

It is also possible to undertake a form of environmental audit at the level of the local government area. These will usually take the form of a **State of the Environment Report**. Typically they outline baseline conditions in a region, attempt to set meaningful targets for improvement, assess priorities, and allocate lead roles for bringing about changes. Subsequent reports will review progress and be disseminated widely within a locality.

Linked into this work has been considerable effort in various parts of the world on developing systems of **Indicators of Sustainable Development.** At their best, these involve the use of readily measurable indicators of local environmental conditions, whilst also embracing issues of social welfare, health, capacity building and so on. These indicators are often at their most useful when they include measures with an emotional as well as a technical value (for instance numbers of migrating salmon in local rivers is immediately meaningful for citizens of Seattle, where the annual salmon run attracts many visitors to witness the spectacle; other indicators might be queues at public toilets or water points as proxies for poor sanitation). They should also be reported on regularly, with the results available to all. Most importantly, they should involve considerable discussion, education, and a role in selection for the community at large, and for preference indicators of impact outside the immediate region as well as within it need to be included. At their most technocratic, incomprehensible and useless, indicators for sustainable development involve long lists of all the possible indicators of environmental quality, no matter how esoteric, often with data which is difficult or expensive to identify and only readily appreciated by experts.

Statutory Plan consultation

An important part of any good statutory plan-making process is going out to public consultation at various stages of the plan's design, from initial principles and broad concepts, to final suggestions. These are often important decisions, so openness and transparency are central to ensuring popular support and a sense of legitimacy for the planning system. In the case of environmental planning, perhaps equally important is the advice on developing priorities and obtaining a local sense of value attributed to different aspects of the built and

natural environment. As such, statutory consultations are a necessary and usually helpful aspect of planning procedures, in land use planning in particular, but also in transport and other aspects of infrastructure planning. The narrow statutory system can be adapted in many different ways to attempt to bring the process closer to communities and businesses, for instance with the use of visioning workshops, to identify key themes and open meetings for attempting to reconcile differences before they become subject to the formal systems of approval and if necessary appeal. Naturally these typical statutory processes are not the only means available for community engagement in environmental management and planning. Most importantly, they cover only a narrow range of environmental concerns, those which can be directly controlled by land use planning and related legislation.

Participatory approaches to planning

There is are a considerable number of approaches to improving systems for community engagement in environmental management and planning. Different approaches are likely to be appropriate in different circumstances.

One of the most successful recent innovations in improving community consultation in planning decisions has been the emergence of Planning for Real exercises. This technique usually involves a close and intense working relationship developing over a period of time between planning experts with an interest in improving community participation and people in the community. Typically, the people running a Planning for Real exercise will spend a few days attempting to get to know an area and a community, and draw up a series of plans and build or draw a series of 'symbols' to represent key parts of the community's desired range of development possibilities, for instance parks, green spaces, a new clinic, workspaces, houses, community centres. Then over an intense few days, typically a long weekend open house sessions will be held for any member of the community to come into an accessible community building to begin to play with these pieces, almost as a jigsaw, trying to assemble workable ways of making the pieces fit together, with the experts providing advice and guidance when requested, and recording the preferred outcomes of the different people that attend. Building on these different preferences, the Planning for Real exercise aims to conclude by drawing up a locally informed and generally agreed framework for development in an area.

A variant on the 'planning for real' theme is the work of community planners, architects and designers, who have rejected the role of the external 'expert' as grand visionary creating technically perfect plans with no apparent need for consultation with the communities upon which they were to be foisted. Community architects, for instance, adopt a modus operandi which centres on working closely with the people who will occupy the buildings which they design, learning

what people's needs and aspirations are, as individuals and as communities. Though time consuming and therefore potentially costly, the advantages to be had are invaluable, in the shape of buildings in which people are comfortable living, which are flexible for future adaptation, and which blend in with local traditions in terms of building materials and so on. Similarly, community planners focus on providing technical assistance to disadvantaged communities to empower them in their interactions with the formal state planning apparatus.

Local Agenda 21

Local Agenda 21 represents an important milestone in recent attempts to create holistic local strategies for the environment, taking into account contemporary concerns with sustainable development. The origin of the Local Agenda 21 movement lies with the decision of the world's political leaders at the Rio Earth Summit in 1992 to call for the production of national strategies for sustainable development into the 21st Century, known as Agenda 21 statements. The same summit also committed governments to supporting the production of Local Agenda 21 statements for every local government area in the world, to be undertaken by all interested parties, involving a central but not exclusive role for local government. The intention was to generate holistic plans, covering environmental, social and economic issues, which would be agreed upon by all the major players in a locality, local government, business leaders and community groups.

Although progress has been uneven in developing these plans, and their levels of consultation and of public commitment to the resulting processes and plans varies enormously, in many cities, in the South as elsewhere, the Local Agenda 21 process has served to galvanise local interest in environmental issues. To put this in context, whilst widely based, holistic local environmental plans were not previously unheard of, they were relatively unusual. An example of a long standing community based environmental management approach is that developed in Ilo, Peru, where progress in this front built up steadily from initial concerns developed during the construction of an Urban Development Plan in 1984. Since then a number of committees have been formed to address specific locally contentious issues, by bringing together all the key players to attempt to explore positive ways forward and to resolve their differences. Many of the decisions of the municipality are now effectively made in a cross-sectoral forum of this nature, with only unresolved issues going to the mayor for final decision-making.[47] It is perhaps invidious to choose just this one example - there are certainly others - this said, it is really only during the 1990s that such work on local environmental plans has taken off, and central to this has been the widespread commitment to Local Agenda 21 (LA21) preparation. Indeed it is perhaps best to see LA21 as a natural progression for many localities, which rapidly speeded up progress among key stakeholder groups in coming

together around environmental issues.

The literature on the development of LA21 stresses the formative role of the process, that it is essentially about the processes of developing consensus not simply the production of a written plan: its essence is the coming together of different groups, the sharing of knowledge, the prioritising of actions and allocation of roles for taking forward the agreed actions in the plan. Inevitably some areas make progress faster than others, since they start with different institutional capacities and traditions, different economic, social and environmental problems, and different barriers to their effectiveness. Problems can include conflicts between technocratic local officials loathe to cede power and information to other organisations, lack of political will, lack of understanding of urban environmental problems, low levels of participation outside meetings, financial instability, lack of commitment from community leaders and business people[48]. It is important to recognise LA21 as being a learning process which does not finish with the production of a plan - it necessarily involves co-ordinated action for taking forward the plan, evaluation, and refocusing. Whilst not that many LA21 processes are yet into the evaluation stage, there has been considerable work on establishing evaluation systems, often linked into the work on sustainable development indicators noted above. An excellent example of this type of work comes from Manizales in Colombia, which has established a system of neighbourhood-level Community Environmental Action Plans and easy to understand indicators where scoring is based on traffic light signals (red is a problem, yellow is a warning sign, green is good quality). Central to this work is an emphasis on engaging the community in monitoring and evaluation work, including the establishment of urban environmental observatories, which are physical locations where the public can access environmental information.[49]

It is useful in this context to consider that when discussing the lack of data, how widespread and regular consultations with all sections of the population can become a key alternative source of data for policy, as in for instance Manizales and in Porto Alegre (within their participatory budgeting process). This has the additional advantage that it is rooted in the expressed needs and priorities of citizens. What we can begin to see in Local Agenda 21 more than in any previous initiative in this sector is the operationalisation of some of the principles for good governance and good environmental management practices outlined below.

4.5 Better governance: decentralisation, subsidiarity and the roles of lower and higher tiers of government

Much work has been devoted to exploring the need for better governance in the South. This tends to focus on three areas. First, a concern about the effectiveness of state institutions in

delivering some of their responsibilities effectively, efficiently and indeed equitably. Second, there has been a questioning of the appropriate areas for direct delivery by state bodies, seeking to identify areas where the state divest itself of this role in favour of taking a role as purchaser of services, as planner, as facilitator or as regulator. Thirdly there is a growing recognition that the state increasingly does not have sufficient expertise or resources to address the problems it faces, and therefore it needs to act increasingly in concert with others, in the community and in the private sector. In consequence of such changes, it is the extended system of possible actors which in effect constitute the governance systems which are the focus of attention here.

There is a widespread belief that improved democratic practices are a prerequisite for improvements in many areas, based on analyses which focus on the potential of state bodies to be sometimes arbitrary and corrupt, remote from citizens, and incapable of adequately performing key regulatory functions[50] Linked to this is the neoliberal critique of the appropriate role for the state in providing key services, as the effectiveness of state providers is challenged and the case for a re-formulation of the roles of the state and private sector is advocated, for instance involving a shift towards privatisation. The World Bank is a leader in such debates, arguing for instance that "An effective state can contribute powerfully to sustainable development and the reduction of poverty" and that this effectiveness can be promoted by democratic reforms and improved participatory mechanisms, in addition to institutional reform in the areas of regulation and performance.[51] Increasingly there appears to be a high degree of convergence from different ideological viewpoints around the need for improved allocation of responsibilities across the different tiers of the state, and a growing consensus that improved participatory mechanisms are required as part of better governance systems.

Decentralisation of resources and powers from central to local government is a useful and powerful policy direction. However this does need to be undertaken in ways which do not undermine essential and effective redistributive functions. In recent years there has been considerable progress in decentralising resources to local government,[52] notably in Colombia, in the belief that this would improve the efficiency and responsiveness of local service delivery. However, progress towards decentralisation has tended to be cautious and slow as central governments are often loath to cede power and tend to doubt the capacity of local government to manage the additional resources and functions effectively. Where decentralisation does occur it is often motivated by a desire to reduce federal spending. This is important in the environmental sphere given the importance of integrated policies which recognise the external impacts of urban behaviour, the possibilities for transferring costs on to other areas, and the need for strong national level actions in support of international agreements. In other words, both local and national policies are

required to meet international responsibilities for promoting and moving towards sustainable development.

It is useful to consider some recent work on local and national constraints on the development of effective Local Agenda 21s in six case study cities (in Uganda, Bolivia, Pakistan, Viet Nam, Benin and Burkina Faso).[53] The most general constraint identified was weak local authorities. The research also stressed how the nature of constraints differs according to the extent of decentralization and of the space given to civil society involvement in environmental management. With high levels of decentralization, there is a tendency to ask too much of local communities. In countries where there has been some decentralization, but where roles and responsibilities remain unclear, one of the main constraints concerns the conflicts between different sectors and departments within governments, as well as conflicts between urban administrations and elected leaders. This usually results from a decentralizing of nominal responsibilities without decentralising concomitant powers or finances.

This links to the subsidiarity principle, which calls for policy making powers to be devolved to the lowest *appropriate* tier of government. Extending it slightly, it also implies the need for all tiers of government to examine the ways in which decision-making processes can become more open to beneficial forms of engagement with outside actors, accepting that governance is about more porous systems of power sharing. Shifting away from more hierarchical and impermeable models of state actions, governance debates highlight the importance of engaging with others around all key policy agendas, reflected in the rise of public-private partnerships in urban policy and also considerable work on building community capacity to ensure that a more bottom-up approach to informing policy making can be successful. This emphasis on capacity building is important - it is necessarily a continuous process rather than a one-off investment. Communities are fluid not static, they start with different capacities and can have different aspirations for integration into policy processes. In the case of environmental management, it is essential for communities can gain access to appropriate technical expertise and also build up their own technical capacities. Perhaps most importantly, they need to feel that they can make their voices heard, influencing policy at the local level.

Whilst there is much rhetoric about commitment to public participation, too often the reality is that this is lacking[54] - and in part this reflects unreasonable expectations of community groups and a reluctance by state authorities to invest in capacity building for this sector - too often attachment to participation reeks of seeking to off-load responsibilities without shifting resources, or of attempts at bureaucratic capture, keeping groups tied to small revenue streams without allowing them to build up the asset base from which they can develop their own revenue streams. Short-term expediency of

this type can turn a community off participation when what is required is a much longer term commitment to nurturing the capacity of this sector.

There are many articles and books now on improving participatory techniques, and also useful critiques of the possibilities and limits of such techniques[55]. In many senses the underlying concerns in terms of environmental management are similar to those for participation in the areas of poverty, economy, housing, and so on - this is hardly surprising as central to the sustainable development debate is precisely the inter-relation of these areas of policy concern. As such all that needs to be stressed here is that improved participatory mechanisms must be central to reforms in environmental management and planning. In Local Agenda 21 in particular we can see the beginnings of a major movement in cities of the South in this direction.

The important point which is being made in this section is that there is a need for power and resources to reside at appropriate levels in systems of governance, and that what is appropriate will vary from country to country, city to city. But in general there needs to be a rebalancing of power and resources in favour of the local rather than the national. This is not a case of either /or. Rather it is looking to capture the benefits of local mobilisation of resources and expertise without losing a sense of integration with regional and national priorities. There is a case too for re-examining the balance of responsibilities and resources between local government, NGOs, community groups and effective private sector providers.

4.6 The Environmental Planning and Management (EPM) Framework

During the 1990s, ideas about urban development and urban environment have been changing dramatically. The Earth Summit in Rio in 1992 powerfully established that environment and development must go forward together in balance, and the City Summit in Istanbul in 1996 emphasised the importance of this perspective for sustainable development of human settlements. There was also growing awareness that limited management capacities, rather than lack of technology or capital, is generally the key constraint to achieving sustainable development - and therefore that changes in approach, policy, and governance are required. Similarly, there was a steady shift in attitudes about development cooperation generally, with more emphasis being put on partnership and participation, on management and governance, and on cross-sectoral and institutionally-based approaches.

It was in this context that the basic EPM framework and its

underlying ideas matured and spread. Through the efforts of UNCHS & UNEP[56] and others, a lengthy process of collaboration and consultation - involving a wide range of cities and international support programmes - was carried out. This allowed the EPM framework to be developed, tested and formulated in a gradual way, reflecting the collective experience of all those involved in the process. The result was written up and published, in 1997, as *The Environmental Planning and Management (EPM) Source Book*, a three-volume synthesis of ideas and experience[57]. The process also led to the formation of the Urban Environment Forum, a global network for those wishing to continue exchanging knowledge and advancing collective know-how in urban environmental management (see Box 4.5).

BOX 4.5: The Urban Environment Forum

The Urban Environment Forum (UEF) is a global network which joins cities, their partners, and international support programmes in their common commitment to improving social and economic conditions in cities through better urban environmental planning and management. From the special meeting held in association with Habitat II (1996) came the Istanbul Manifesto which established the UEF. A large and successful international meeting was held the following year (1997) in Shanghai, mandating a variety of regional follow-up meetings which were held in 1998. The UEF-Euro'98 meeting was held in Moscow, for instance, bringing together European and other delegates; a regional meeting for Africa was also held. In 1999 a large-scale global meeting will again be convened. Between meetings, the secretariat of the UEF (provided currently by UNEP & UNCHS) maintains communication as well as linking and supporting other activities of UEF members, including the steady accumulation of case study information which will be used in up-dating the EPM Source Book. Volume 3 of the Source Book contains a directory of UEF members as of early-1997, although the membership has since expanded significantly through the Shanghai meeting in 1997 and the regional meetings in 1998. (Further information may be obtained through the UEF website: http://www.unep.org/unon/unchs/uef/home.htm. or by email to UEF secretariat: uef@unchs.org.

The EPM Framework thus formulated is a systematic description of a general process of urban environmental management. It is derived from real-work practice in cities, drawing upon the actual experience of cities and of the international programmes which support them. In this sense, it is an expression of "collective know-how". By focusing on a general management process (and not on the details of particular environmental issues), the EPM framework approach has allowed cities with vastly different circumstances to meaningfully share their knowledge and ideas. Indeed, one of the key lessons of the whole EPM exercise was that in terms of general process and approach, cities around the world face rather similar problems and thus it is possible and fruitful for them to "compare notes" on this basis[58].

The EPM Framework as developed so far, can be summarised into two components: the first describes how cities go about trying to improve the urban environment. It categorises actions under five general headings, which are in turn sub-divided; together, these represent the broad over-all approach to urban environmental planning and management which has emerged through the EPM consultation process. These are shown in summary form in Box 4.6; a fuller explanation is given in the *EPM Source Book*.

**Box 4.6: The EPM Framework -
How cities improve the urban environment**

1. Cities Improve Environmental Information and Technical Expertise
   ➡ preparing basic over-view information
   ➡ involving stakeholders
   ➡ setting priorities
   ➡ clarifying selected priority issues

2. Cities Improve Environmental Strategies and Decision-Making
   ➡ clarifying issue-specific policy options
   ➡ considering implementation options and resources
   ➡ building broad-based consensus on issue-specific strategies
   ➡ coordinating environmental and other development strategies

3. Cities Improve Implementation of Environmental Strategies
   ➡ applying the full range of implementation capabilities
   ➡ agreeing on action plans for implementation
   ➡ developing packages of mutually supportive interventions
   ➡ reconfirming political support and mobilising resources

4. Cities Institutionalise Environmental Planning and Management
   ➡ strengthening system-wide capacities for EPM
   ➡ institutionalising broad-based participatory approaches to decision-making
   ➡ institutionalising cross-sectoral and inter-organisational coordination
   ➡ monitoring, evaluating and adjusting the EPM system

5. Cities Make More Efficient Use of Resources for Effecting Change
   ➡ utilising special opportunities
   ➡ applying specific leveraging strategies
   ➡ networking among cities
   ➡ making strategic use of external support

The second component of the EPM framework looks at how international programmes support cities in their efforts to improve the urban environment. The review of support programme activities, analysed in the context of the categories shown in Box 4.6, suggested five main groupings[59] of international programme activity; these are summarised in Box 4.7.

Finally, as a result of the enthusiasm of participation in the various international meetings and activities during the development of the EPM Framework, it was agreed to form a

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**Box 4.7: The epm Framework -
How international programmes support cities in improving their urban environments**

1. *Demonstration:* supporting urban environmental management demonstration projects at city and neighbourhood level

2. *Networking:* assisting cities to "network" and to exchange know-how and learn from each other

3. *Specialised Expertise:* providing specialised expertise and information crucial for urban environmental management

4. *Applied Research:* supporting applied research and development which is practical and relevant for urban environmental management

5. *Strategic Capital Improvement*: supporting priority capital investments which are key elements of the city's agreed environmental management strategies

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loose coalition of interested cities and their partners so this work of information and experience exchange could continue. Thus was born the Urban Environment Forum (UEF), which was officially launched at a special meeting held in Istanbul in June 1996 on the eve of the Habitat II Conference. The UEF remains quite active (see Box 4.5) and is extremely valuable as a forum in which the cities take the lead, giving international support programmes an opportunity to see what the cities themselves think needs to be done.

This in some ways is perhaps the most important aspect of both the UEF and the EPM Framework: the key urban environmental issues should be identified by the cities themselves ("bottom-up") and not by distant "authorities" feeding through donor programmes and funds ("top-down"). Of course, a partnership is to be desired, with the experience and knowledge of the international programme helping the cities in the process of working out their priorities and approaches to environmental management. But the emphasis should remain firmly on the ability of cities in the developing countries, working through a systematic participatory EPM process, to identify and evolve their own views about what is most important to be done and how best it can be done in their circumstances[60].

4.7 Some implications for donors

This section has highlighted a range of activities for donor agencies to consider in their urban work. Broadly speaking these can be categorised into efforts to ensure that projects which they are involved with operate to high environmental standards and efforts to improve the capacity of local agencies to improve their own work in the environmental area. Although formal environmental plans have been relatively rare in cities in the South,[61] in recent years there has been a rapid

growth on this front. In particular, there has been a rapid growth in bilateral assistance in developing environmental plans and in multinational networks of cities keen to share aspects of good practice.[62]

A key message for donors it is important to see the environmental aspect as integral to all types of project, not as a stand alone category. Sustainable development is critically

about the interplay of environmental, social and economic goals, attempting to move forward on all three fronts together. To assist in guiding people thinking about whether their work helps support the objectives of sustainable development Box 4.8 here sets out some broad principles for guiding policy actions in this area, whilst Box 4.9 sets out a broad framework of policy recommendations.

Box 4.8 Some policy principles for urban environmental management and planning

Build broadly constituted networks of actors interested in promoting sustainable urban development, across all sectors of society.

Recognise the holistic nature of sustainable development, with its necessary combining of policies to develop the economy, society and environment in parallel.

Build stronger public-private partnerships with a view to exploring ways in which each sector can contribute to the work of the other.

Develop flexible and consistent regulatory systems, built around strong public consensus.

Promote effective use of existing and planned infrastructure - don't rely on expanding infrastructure systems alone to address problems of under-provision - demand management techniques can highlight and address areas of ineffective or under utilization of system capacity.

Use a range of policy tools in promoting sustainable development, including environmental management and planning, economic reform, regulatory reform, education and information.

Anticipate and counter potential adverse policy impacts - for instance increased water prices may improve stewardship of the water resource, but it may leave the poor unable to afford one of life's basic necessities.

Establish environmental priorities by developing appropriate systems for identifying environmental capacities, risks, and tolerances, linking these to action plans with regular evaluation.

Promote political decentralisation and regional coordination, adopting the subsidiarity principle.

Educate and inform - people are more likely to change their behaviour patterns to support sustainable development when they understand the issues at stake.

Promote the role of community organisations and NGOs as necessarily complementary to the work of the public sector, but beware of opportunist attempts for inappropriate or ill-conceived off-loading of state responsibilities.

Increase and diversify accountability systems in recognition of the more complex patterns of emergent governance systems, with transparency, participation, decentralisation and targeting of all social groups, and community-oriented evaluation systems central themes to be addressed.

Box 4.9 Some Recommendations in the fields of environmental management and planning

Environmental strategies
1. The status of physical, environmental and socio-economic planning should be reasserted rather than submerged by urban management policies
2. There is a need to clarify, codify and strengthen regulatory responsibilities and to recognise that environmental problems require a simultaneous response at the local, city and regional levels.
3. There is a need to maximise proactive income generation activities through which an economic base can be linked to the protection of the environment.

Spatial Strategies
1. Professional practice should enhance spatial and social integration rather reinforce spatial and social segregation.
2. There should be an increased emphasis on slum rehabilitation and peripheral densification in an environmentally sustainable and socially acceptable manner.

Cross sectoral actions
1. Recognising that social and economic marginalisation tend to provoke short-term actions which can damage the environment, attention needs to be paid to ways of integrating environmental actions with those to address poverty and economic development.
2. Information, education and dissemination are all essential attributes of a holistic approach to improving the environment, building awareness of the nature of environmental problems and of policies for addressing them.
3. Energy saving can produce major improvements to both the local and global environment, but to be effective it often requires a cross-sectoral approach, for instance linking transport and land use planning, and urban design with changes to planning and building control standards.

Good governance
1. Promote the coming together of private, public and community sectors to develop rolling programmes of work around Local Agenda 21
2. Develop accessible information bases so that all citizens have access to information about the condition of the local environment, including ways to influence the local political systems and ways of improving the state of the environment which can be pursued by individuals, communities acting in concert, and businesses.

The first two sets of recommendations are taken from a table in Burgess et al.[63]

Notes and references

1   See Chapter One in Haughton G and Hunter C (1994) *Sustainable Cities*, for an overview of some of the anti-urbanist literature.

2   Harris, N. (ed.) (1992) *Cities in the 1990s: the challenge for developing countries.* UCL Press, London. This is a report of a seminar. In it Patrick McAuslan talks about the models of the north as being ones of containment, suppression and waste, where excessive 'professionalisation' of planning has divorced councilors and the public from active engagement in decisions which affect their every day lives (pp.96-7).

3   Haughton and Hunter, op cit.. Chapter 7.3. See especially Box 7.7. which lists examples of environmental charges and taxes under the following headings: transgression and enforcement charges; effluent charges; user charges; natural resources user-pays charges; market creation (including trading permits); liability or risk insurance obligations; policing and administrative charges; deposit refund measures; and ownership charges (such as car or road taxes).

4   Burgess, R, Carmona, M and Kolstee, T (1997) 'Contemporary spatial strategies and urban policies in developing countries: a critical review' in R Burgess, M Carmona and T Kolstee (eds.) *The Challenge of Sustainable Cities: neoliberalism and urban strategies in developing countries*. Zed Books, London.

5   Burgess et al., *ibid.*.

6   Haughton and Hunter, *op cit.*.

7   Burgess et al., *ibid.*.

8   Werner, E (1997) 'Urban small-scale production and environmental health in developing countries' *Third World Planning Review,* 19 (4) 385-400.

9   Roseland, M (1998) *Towards Sustainable Communities: resources for citizens and their governments.* New Society Publishers, Gabriola Island, Canada. Cowan, R (1997) *The Connected City: a new approach to making cities work*. Urban Initiatives.

10   Gilbert A (1998) *The Latin American City,* Latin American Bureau, London

11   Vasconcellos, E.A. (1997) 'Transport and environment in developing countries: comparing air pollution and traffic accidents as policy priorities' *Habitat International,* 21 (1), 79-89.

12   Onn, Y.S. (1995) 'Controlling road traffic in Singapore.' In J Lidston (ed.) *Global Issues of Our Time,* Cambridge University Press, Cambridge.

13   Gilbert, A (1998) *op cit.*.

14   Brown, L. R. (ed.) (1991) *The State of The World,* Allen and Unwin. Cited in Onn, Y.S. (1995) op cit..

15   Onn, Y.S. (1995) op cit. Seik, F.T. (1998) 'A unique demand management instrument in urban transport: the vehicle quota system in Singapore' *Cities* 15 (1), 27-40.

16   Hin, D.H.K.H, Chong, R.T.Y., Wai, T.W. and Briffett, C. (1997) 'The greening of Singapore's national estate' *Habitat International,* 21 (1), 107-21.

17   Seik, F.T. (1997) 'An effective demand management instrument in urban transport: the area licensing scheme in Singapore' *Cities,* 14 (3), 155-64.

18   Roseland, M op cit.

19   A Douglas fir is capable of absorbing 18kg a year of sulphur dioxide without harming itself, whilst a sufficient mass of roadside plants can help reduce localised carbon monoxide levels. At a global level, trees help absorb the greenhouse gas carbon dioxide and produce harmless oxygen..

20   Roseland, M. op cit.

21   Velásquez, L.S. (1998) 'Agenda 21; a form of joint environmental management in Manizales, Colombia.' *Environment and Urbanization,* 10, 2, October.

22   Mbiba points out that though periodic harassment of those engaged in urban agriculture by civic authorities is common in African cities, including in her own case study of Harare, Zimbabwe, it is not the only approach. In Maseru, capital of Lesotho, authorities seek an integrated approach to supporting urban agriculture, recognising its role in the livelihoods of many of the urban poor. Mbibia, B (1994) 'Institutional responses to uncontrolled urban cultivation in Harare: prohibitive or accommodative?' *Environment and Urbanization,* 6 (1), 188—202

23   Smit, J and Nasr, J (1992) 'Urban agriculture for sustainable cities: using wastes and idle land and water bodies as resources' Environment and Urbanization, 4 (2), 141-152. Mbiba (1994, op cit.) provides a more conservative estimate of 29% of urban household in Kenya growing crops, 17% keeping livestock.

24   Carneiro, SMM, Carneiro, AL and Crocetti, ZS, 'Urbanisation in Brasil'. In J Lidston (ed.) *Global Issues of Our Time,* Cambridge University Press, Cambridge. Also Haughton and Hunter, op cit..

25   In the case of Padang, Indonesia, for instance the World Bank insisted on an alternative location for a university than the site identified in the local plan. Though the resultant location was not a major problem it did require the building of a new road by the municipality. Colombijn F (1996) 'Padang' *Cities* 13 (4), 281-88.

26   For a good overview of these issues, see Moore D.R. and Ahmed, N. (1997) 'Proposal for the development of an indigenous materials and methods-oriented design data aid for design professionals practicing in developing nations' *Habitat International,* 21 (1), 29-49.

27   Correa, C. (1989) *The New Landscape: urbanisation in the Third World*, Butterworth, Sevenoaks.

28   Sudarmo, S.P. (1997) Recent developments in the Indonesian urban development strategy' in R Burgess, M Carmona and T Kolstee (eds.) *The Challenge of Sustainable Cities: neoliberalism and urban strategies in developing countries*. Zed Books, London.

29 Mukoko, S (1996) 'On sustainable urban development in sub-Saharan Africa,' *Cities,* 13 (4), 265-71.

30 Mukoko (1996) ibid..

31 Studies in the US show that municipal composting often does not cover costs, except where landfill costs are exceptionally high. However, in the South, with lower labour and land costs the constraints are different and costing is potentially more viable. For the US, see Renow M and Rubin (1998) 'Does municipal solid waste composting make sense*? Journal of Environmental Management,* 53 (4), 339-47. For cities in the South, see Furedy C (1992) 'Garbage: exploring non-conventional options in Asian cites' *Environment and Urbanization,* 4 (2), 42-54; and Poerbo, H (1991) 'Urban solid waste management in Bandung: towards an integrated resource recovery system'*, Environment and Urbanization,* 3 (1), 60-69.

32 Pacheco M (1992) 'Recycling n Bogotá: developing a culture for urban sustainability' *Environment and Urbanization*, 4 (2), 74-9.b

33 van Beukering, P. (1997) 'Waste recovery in Bombay: a socio-economic and environmental assessment of different waste management options' *Third World Planning Review,* 19 (2), 163-87.

34 See Poerbo, *op cit.,* Furedy, *op cit.,* and van Beukering, P. *op cit..*

35 We should not exaggerate the distinction here. Overseas consultants increasingly look to small-scale, less costly solutions, sometimes being over-ruled by local politicians and professionals intent on buying-in more visible, large scale technical solutions.

36 Vincentian Missionaries (1997) "The Payatas Environmental Development Programme: micro-enterprise promotion and involvement in solid waste management in Quezon City", *Environment and Urbanization* Vol.10 No.2,

37 World Bank (1997) *World Development Report 1997. The State in a changing world.* Oxford University Press, Oxford., p. 116.

38 Desai, V (1996) 'Access to power and participation' *Third World Planning Review,* 18 (2), 217-42.

39 Nyoh, A.J. (1997) 'Colonial spatial development policies, economic instability, and urban public transportation in Cameroon' *Cities,* 14 (3) 133-44.

40 Gilbert A (1998) *op cit..*

41 Lee, Y.F. (1997) 'The privatisation of solid waste infrastructure and services in Asia' *Third World Planning Review,* 19 (2), 139-162.

42 Fuks, M (1998) 'Environment-related litigation in Rio de Janeiro: shaping frames for a new social problem' *International Journal of Urban and Regional Research*, 22 (3), 394-407.

43 Bullard, R. (1990) *Dumping in Dixie: race, class and environmental quality,* Westview Press, Boulder, Colorado, USA.; Bullard, R. (1993) (ed.) *Confronting Environmental Racism: voices from the grassroots,* South End Press, Boston, Mass.. Hofrichter, R. (ed.) (1993) *Toxic Struggles: the theory and practice of environmental justice,* New Society Publishers, Philadelphia, USA, pp. 67-75; Heiman, M. (1996) 'Race, Waste and class: new perspectives on environmental justice' *Antipode,* 28 (2), 111-21.

44 Barrow CJ (1997) Environmental and Social Impact Assessment: an introduction. Arnold: London. This is a useful overview text, particularly chapter 7 'Impact assessment in developing countries.' This chapter highlights the potential value of assessment procedures for urban areas in the South. It also points out that according to one survey only 7 out of 121 developing countries had established frameworks for impact assessment.

45 Barrow (1997, *ibid.*

46 The best available summary of the role of environmental capacity studies in planning can be found in Jacobs, M. (1997) 'Making sense of environmental capacity' CPRE, London

47 Díaz, D.B., Follegatti, J.L.L. and Hordijk (1996) Innovative urban environmental management in Ilo, Peru' *Environment and Urbanization,* 8 (1), 21-34.

48 Miranda, L. and Hordjik, M. (1998) 'Let us build cities for life: the national campaign of local agenda 21s in Peru' Environment and Urbanization, 10 (2).Myers, G.A. and Mujahir, M.A.H. 'Localising Agenda 21: environmental sustainability and Zanzibari urbanisation' *Third World Planning Review,* 19 (4), 367-84.

49 Velásquez, L.S. (1998) *op cit..*

50 World Bank, 1997, op cit.. However, Gilbert A (1998) *op cit.,* argues that in Latin America local government is often effective given the constraints within which they operate and the scale of challenges which they face.

51 World Bank (1997, op cit., quote from p. 99).

52 Kyung-Hwan, K (1997)'Improving local government finance in a changing environment' Habitat International, 21 (1), 17-28.

53 Wacker, Viaro and Wolf "Partnerships for urban environmental management - the role of urban authorities, researchers and civil society."

54 Desai, V (1996) op cit..

55 A good overview of the literature and critique can be found in Mitlin D and Thompson J (1995) 'Participatory approaches in urban areas: strengthening civil society or reinforcing the status quo?' *Environment and Urbanization,* 7 (1), 231-50.

56 Key support was given by the Sustainable Cities Programme (of UNCHS & UNEP) and especially by the cities which participate in that programme, as well as by the Urban Management Programme (UNCHS, UNDP & IBRD); the U.K. and the Netherlands gave major financial support and many other donors contributed to various parts of the process.

57 This was published by UNCHS and UNEP. Volume 1 - *Implementing the Urban Environment Agenda* presents the basic EPM Framework with summary case study examples to illustrate individual steps in the process. Volume 2 - *City Experiences and International Support* contains 33 case study abstracts of city experiences as well as descriptions of the activities of 22 international support programmes. Volume 3 - *The Urban Environment Forum Directory* contains full names and contact information for all the participating members of the Urban Environment Forum.

58 The EPM Framework is not seen as an exclusive or exhaustive "answer" to the many complex questions of urban environmental management. On the contrary, it can coexist and be applied alongside many other perspectives. Its great virtue is its general applicability and its ability to provide a clear logical framework for analysing diverse experiences in a way which is relevant for urban managers and practitioners. In this role, the EPM Framework is a powerful tool which was proven its worth over several years.

59 In the original publication only four categories were listed; the fifth category (strategic capital investment) was added as a result of discussions at the Urban Environment Forum.

60 It is a well-demonstrated truism of development management that if the problem identification and/or solutions are imposed by the donor - and not genuinely understood or accepted by the recipients - the local participation will tend to be half-hearted and the chances of success (especially after the donor has departed) tend to be very low.

61 Gilbert, R, Stevenson, D, Girardet, H, and Stren, R (1996) *Making Cities Work: the role of local authorities in the urban environment.* Earthscan: London.

62 Gilbert R *et al.* (1996) *ibid..*

63 Burgess, R, Carmona, M and Kolstee T (eds.) (1997) *The Challenge of Sustainable Cities: neoliberalism and urban strategies in developing countries*. Zed Books, London. p.280.

5. Donor Support for Urban Environmental Improvements

5.1 General Approaches to Supporting Urban Environmental Improvement

Based on the insights discussed in the preceding chapters, and drawing upon many years of practical experience, it is possible to identify the main approaches to urban environmental improvement which have generally been adopted for donor interventions. These categories tend to over-lap, of course, as donor programmes or projects often involve several levels and/or areas of activity. Nonetheless, the following five categories may usefully serve to organise the present state of thinking about how donors can best support cities in achieving environmental improvements.

(i) Donor support for improvements in the quality and capacity of urban environmental management.

For most donors (bilateral as well as multilateral) this has become a primary approach to the urban environment, increasingly in programmes directly aimed at strengthening capacities but also as capacity-building components within other programmes. To some degree, this trend derives from a wide-spread concern with **good governance** - which in turn grows out of an understanding that institutional, organisational and political factors are crucial for successful development cooperation activities generally.

A key element of "good governance" at the local level is a concern with *urban management*. Experience has shown, however, that generalised activities in urban management tend to be too diffuse to be reliably effective[1]; efforts have usually been more successful when focussed on particular aspects - such as urban **environmental** management. Indeed, urban environmental management has proven to be a very useful and powerful focus; by aiming directly at the crucial environment-development nexus, it better mobilises political and popular interest while providing concrete entry points into the urban planning and development management system.

Equally, decades of disappointing results in sector-based interventions have shown the difficulty of attempting 'technical' improvements which are not coordinated with or part of broader efforts to embed those sectoral activities in the operational, financial and managerial systems of the city. Also, because of the inter-connectedness of urban sectors (especially in the environmental context) it is difficult to successfully deal with them in isolation[2]. All of this reinforces the increasing importance of urban environmental management as an organising concept for donor support to improving urban environment.

(ii) Donor support for sector and/or area specific interventions targeted specifically for low-income and other vulnerable groups

These interventions seek to improve environmental conditions and health in urban areas, primarily for the benefit of low income groups. They are usually area-specific in focus, for instance slum-improvement and up-grading schemes which work in low-income areas. Given the well-known difficulties of delivering benefits exclusively to targeted households, area-based schemes which physically provide improved environmental infrastructure and services in low-income areas are often the only effective way of reaching the poor with significant improvements in their living conditions and health. Typical projects of this type include:

➡ sector-specific projects wholly or mostly in low-income areas to improve the quantity/quality of local water supply, or to install/up-grade local drainage and sanitation facilities, or to improve local solid waste collection and disposal, etc.

➡ projects to improve housing conditions (such as "slum" and squatter upgrading programmes), often also including a range of associated improvements to basic environmental infrastructure - and perhaps including as well housing finance/credit programmes that support low-income families in building new housing or improving and extending existing housing;

➡ projects, again often on an area-specific basis, which directly address different components of primary health care, including disease control and emergency services. Although primary health care is generally not considered as an ˜environmental' category, most of the diseases and injuries that it seeks to prevent and treat are caused by or spread by or aggravated by environmental conditions;

➡ projects aimed at reducing the risks faced by low-income groups from a variety of natural disasters, especially those (such as flooding and land slippage) which are highly influenced by local environmental conditions.

There are also projects and programmes which combine environmental with other policy concerns. For instance, income generation in the environmental sector is an area of particular interest, from efforts to support and enhance recycling activities to more ambitious attempts to promote new environmental technologies and processes. Donor support to local NGOs and to local social funds in low-income areas often include help for local environmental initiatives.

(iii) Donor support for large-scale and/or city-wide environmental infrastructure improvements

These interventions generally support the provision or up-grading or operational improvement of key elements of environmental infrastructure, on a city-wide basis or on a large scale covering substantial parts of the city. Unlike projects or programmes in the previous category, benefits to low-income populations are usually a secondary rather than primary focus.

In many cases, the large-scale or city-wide improvements are necessary to support local improvements, such as provision of bulk water supplies, or connection of main drainage systems, without which local area improvements will not function. Examples of interventions in this category might include:

➡ increasing and/or improving freshwater supplies for entire cities or city-regions (including the construction of reservoirs and water treatment plants and distribution mains as well as watershed management);

➡ comprehensive clean-up programmes for important urban water bodies and/or water courses, typically involving a wide range of operational interventions as well as physical improvements;

➡ improving the management of liquid wastes, including large-scale and city-wide sewer connections and networks as well as sewage treatment facilities;

➡ building and/or improving collection and especially safe disposal of solid wastes, particularly including industrial, hospital, and hazardous wastes.

(iv) Donor support for pollution reduction and environmental improvement.

There are also many city-wide or large-scale programmes and projects aimed directly at improvement of urban environmental quality (air or water pollution, for example) rather than concerned with environmental infrastructure - although there is obviously considerable overlap in the two categories. Large-scale programmes to support public health improvements may also be included, for example city-wide health education campaigns, mosquito control, vaccination, etc. In addition, projects aimed at major environmental elements in the city, such as large city parks or urban lakes, would fit her, as would programmes for urban "greening" and afforestation. Projects focussed on key pollution sources, on electricity production, on energy efficiency, on clean production, and on the transfer of environmentally-suitable technology would also fall into this category.

Many of these intervention tend to require a wide variety of inter-related actions. For instance, an air pollution control programme may include a number of the following:

➡ measures to increase thermal efficiency and reduce emissions in small-scale heating and power plants, especially those dependent upon coal;

➡ city-wide public transport improvement and traffic management schemes designed to improve mobility and reduce pollution by measures to constrain car and motor-bike use and measures for emission control (such as unleaded petrol);

➡ systematic introduction of clean technology in the city's industries;

➡ afforestation and soil-cover greening.

(v) Donor support for other interventions which may have important environmental implications for the cities.

Many other development interventions may have important environmental linkages and implications in the city. These include donor support for major urban infrastructure projects such as ports, airports, bridges, highways, markets, electrification, telecommunications, etc. In addition, support for large-scale urban investments such as industrial estates, commercial centres, housing developments, etc. In all these cases, the primary focus is not on environment; but these interventions nonetheless have potentially major implications both for urban growth and development and for the urban environment. It is increasingly the policy of donors to ensure that such large-scale investment projects are implemented in a way which is properly coordinated with urban environmental management. To take one example, donor support for electric power generation can be implemented to minimise urban air pollution impacts by careful siting and installation of low-pollution technology, emission control equipment, and proper monitoring systems.

5.2 OECD-DAC Member Initiatives in Urban Environment

Most of the member countries of OECD-DAC have considerable experience with interventions focussed on urban environmental improvement; for some, urban environment has already become a priority area of activity. To illustrate the range of this experience, member country representatives on the Interest Group provided information about urban environment projects or programmes which they considered to be examples of "good practice". Information on 26 such projects or programmes was submitted, from eleven different country donors. (Annex One provides a short description of each of these projects or programmes.)

It must be emphasised that these are only examples, selected by the particular OECD-DAC Interest Group representative who submitted them. There was no effort to comprehensively review all the activities of each member country - itself an impossibly large task - or to otherwise ensure a systematic sample of case studies. Instead, the only criterion was that the submitted case studies should be good examples which illustrate the work being done by that organisation in the field of urban environment.

Those submitting Case Study examples were asked a set of

questions, in respect of each project or programme, aimed at drawing out key lessons and conclusions. The responses have been tabulated and the results are summarised below.[3] As the Case Studies covered a wide range of often quite different types of interventions, it is not possible to secure quantitative answers or to make a quantitative analysis of responses. However, there was a considerable degree of consistency and similarity in the responses, especially in regard to certain key points, and this provided the basis for selection of the information shown in the lists below. Many of these points will be familiar, of course, as they are often characteristics of "good practice" in development cooperation generally. Nonetheless, it is significant that so many case studies specifically in urban environment have drawn these same lessons and identified these same factors.

(1) What are the Key Over-all "Lessons" which you would draw from your experience with the project/programme?

1. Projects can effectively combine environmental improvement with poverty alleviation although this requires intensive, sustained, and often micro-level interventions.

2. Making significant and sustainable improvements in environmental conditions in poor areas is possible, but it requires a long-term perspective and sustained action in partnership with local stakeholders.

3. Management capacity is the principle bottleneck in efforts to improve the urban environment, not capital or technology) and projects which focus directly upon improving urban environmental management have the biggest potential pay-off.

4. Changing the attitudes and perceptions of people and organisations is the key task, which underlies other efforts to change their practices and enhance their capabilities to improve the urban environment.

5. Broad-based stakeholder participation is essential to ensure proper project design, to support implementation, to mobilise local resources, to complement local government capabilities, and especially to ensure sustainability of project achievements.

6. Working directly with local governments can be difficult and troublesome, but persistence in doing so is vital for long-term success; projects should avoid setting up parallel or competing institutions.

7. External inputs (capital, expertise, technology) have to be applied in careful balance with local absorptive capacities, which are generally quite limited, especially in the environmental field.

8. Working closely and directly with the local private sector is crucial for success in implementation of environmental improvements in most countries.

9. Local financial participation (matching funds, shared investment and risk) is very effective in securing genuine commitment - and sustainability of the project.

10. Concrete and visible actions (pilot projects, special campaigns) are vital for establishing local commitment and support - and building the basis for wider replication.

11. Working on issue-specific problems (rather than comprehensive city-wide approaches) allows the value of the new activities to be worked out and demonstrated in a manageable and understandable way, facilitating replication and sustainability.

12. Effective and sustained programmes of public information-education-communication are essential to support environmental improvements initiatives.

13. Resources (financial, human, technical, organisational) are usually available at the local level, but mobilisation of such resources is a difficult yet crucial task for developing sustainable improvements in urban environment.

14. Active collaboration with other donor-assisted interventions is difficult but can be extremely effective in urban environmental programmes because of the clear complementarities of activities in the environmental field.

15. When dealing with capacity-building for urban environmental management, the very practical and 'learn-by-doing' approaches are the most effective.

16. Projects dealing with similar environmental issues/problems in different cities or countries have considerable potential for mutual learning and replication.

17. Technologies, soft or hard, must be carefully adapted and customised for local conditions; this applies particularly to capital equipment for environmental improvements.

18. Because of the cross-cutting nature of urban environmental issues, and the widely-shared concern for the environment, urban environment interventions have proven to be a good vehicle for stimulating and strengthening local dialogues, cooperation, and problem-solving coalitions.

(2) What were the important successes or accomplishments in each project/programme?

1. Capacity-Building in core areas of urban environmental

management was achieved, effective in both local government and in other local partners, including particularly practices of cross-sectoral and inter-departmental cooperation.

2. Effective networks of cooperation and collaboration among public sector, private sector, and community groups/NGOs was successfully established.

3. Local financial resources were successfully mobilised (from both public and private sources) and applied to local environmental improvements.

4. Experience from city projects in different countries was exchanged and pooled, as well as used as the basis for replication in additional cities in those and other countries.

5. Sector-specific and over-all environmental management and urban development planing process were established and operated.

6. Local community and city-wide solid waste management systems were established and continued functioning in a variety of different settings and contexts.

7. Local water purification systems were developed and successfully operated.

8. Locally-adapted models for Green Communities and for Local Agenda 21 were successfully developed and applied.

9. Local factories were shown the real gains (financial, reduced pollution) from proactive approaches to energy and waste management.

(3) What were the most important factors which influenced or contributed to the successes?

1. Introducing multi-stakeholder participation from the beginning and continuing with it throughout, including into implementation and afterwards.

2. Working directly with the private sector.

3. Working with a cross-section of government departments and agencies.

4. Strong leadership and strong support (and participation) from Community groups, NGOs, and other key stakeholders and local groups.

5. Consistent political support.

6. Systematic and sustained public awareness campaigns, local education programmes, intensive publicity, and other such measures.

7. Development and utilisation of locally-adapted training and information materials, and their use in a variety of training activities (also using local training support organisations)

8. The successful use of Pilot Projects to demonstrate approaches and to mobilise support, as well as to test project methodologies before larger-scale application. Leveraging funds by organising joint and complementary funding by other donors.

10. Reliance upon low-cost and locally-appropriate technologies (hard and soft).

11. Staying with the project over a long period of time - providing project support on a sustained and steady basis.

(4) What were the significant constraints or difficulties in each project/programme?

1. The top-down and bureaucratic style of local government is a constant constraint, delaying project implementation, making difficulties with broad-based participation, etc.

2. Local government organisations are limited in capacities - limited staff, poor technical resources, high-turnover, limited authority, corruption, etc.

3. Tendency of politicians and senior officials to prefer new capital investments to the more difficult tasks of managing existing facilities and systems.

4. The reluctance of central governments to actually give (as opposed to promise) local government the power, authority and resources needed for them to actually take up local the responsibilities of local development management.

5. Local contractors and suppliers lack the skills, equipment, experience and capability to undertake many of the tasks required.

6. Elections bring extensive changes of staff, including technical staff, disrupting the progress of projects.

7. Longer-term initiatives such as capacity-building are difficult to sustain because of the politicians' desire to quick results and easy solutions., reinforced by the desire of some donor organisations for fast commitment of funds and simple quantifiable results.

8. The reluctance of many donor organisations, as well as government counterparts, to accept that capacity-building and changing of practices is a long-term process which requires sustained support and intervention.

9. The difficulty of actually getting the time and energy of counter-parts from public sector organisations and having them actually work on the project on a sustained basis.

10. Limitations on funding, not only within projects and programmes, but also with respect to the agencies and organisations which are charged with the investments actually needed to implement environmental improvements.

11. National economic crisis (especially in Asian countries).

12. The lack of skills and experience in local NGOs and community organisations often required substantial training and support resources.

(5)   In what ways does each programme/project illustrate the importance and/or usefulness of focussing on Urban Environmental Management?

1. The linking of previously un-related (or competing) groups through an environmentally integrated approach was a valuable new achievement; the focus on cross-cutting environmental issues facilitated the building of partnerships and participation.

2. The focus on local environmental initiatives and urban management facilitated the building up of results and experience, providing real progress toward larger-scale or city-wide (or even global) environmental concerns.

3. By focussing on urban environmental management, it has been possible to improve understanding of environmental implications in relation to urban development.

4. Projects focussed on an environmental issue on a single-sector or agency-specific basis have revealed the need for a cross-cutting environmental management approach.

5. Work in one environmental sector provided a good entry point into work in related environmental and development sectors.

6. By focussing on urban environmental issues and dealing with specific local situations, the results have greater credibility and hence greater scope for replication.

7. The urban environment approach, focussed on specific local issues, gained broad-based local support in a way which focussing on general (global, national) issues could not.

(6)   What were the specific gains for the urban environment through each project/programme?

1. The majority of local households now separate waste at source and many are recycling with composting.

2. Recycling at the community level has significantly increased, reducing solid waste volumes and producing a general increase in cleanliness of streets and public spaces.

3. The project brought about a sustained higher rate of collection and safe disposal.

4. Improved landfill practices were sustained and lowered on-site pollution.

5. There has been a great increase in public awareness about - and concern for - issues of waste management.

6. The project has shown the economic and environmental benefits of small-scale composting at hotels, schools and other institutions.

7. The quality of water in the local river has improved - and stayed better.

8. Waste water is being successfully recycled, with significant benefits to local farmers.

9. Small-scale waste water methods, suitable for small urban areas, have been proven in practice and are being locally replicated.

10. Urban reforestation schemes have been successfully implemented, visibly raising the level of "green" in the area.

11. Energy consumption and waste discharges from three large factories have been significantly reduced by changes in technology and management.

12. Improvements to the sewer system have brought about significant reductions in flooding of waste water during the rainy season.

13. Revised urban design schemes for a city centre have been evolved on the criterion of reducing atmospheric pollution.

14. Local awareness of the relevance and usefulness of a "Local Agenda 21" framework has been significantly raised.

5.3 An EPM Analysis of Support Modalities in the Case Studies

In its earlier work on the *EPM Source Book*, the United Nations developed a set of simple categories into which were fitted the activities of international support programmes which were focussed on urban environmental management. These categories (explained briefly in Chapter 4 in the section describing the UN's EPM Framework) differentiated interventions in terms of modalities of support - i.e. the ways in which the programmes or projects sought to support cities. In most cases, the donor interventions fitted into more than one category, although it was often possible to identify the primary modality of activity as well as the secondary[4].

When the 26 case studies submitted by the OECD-DAC member countries were similarly analysed in terms of these categories of "support modality", a consistent picture emerged (the results are summarised graphically in Table 5.1). All had a primary thrust in either "Demonstration" - supporting urban environmental demonstration projects at city and neighbourhood level, or "Specialised Expertise" - providing specialised expertise and information crucial for urban environmental management; many had a primary thrust in both. About two-thirds had also a primary or (more often) secondary thrust in one or occasionally two of the remaining three categories: "Networking" - assisting cities to network and to exchange know-how and learn from each other, "Applied Research" - supporting applied research and development which is practical and relevant for urban environmental management, and "Strategic Capital Improvement" - supporting priority capital investments which are key elements of the city's agreed environmental management strategies.

Table 5.1 -
How Projects/Programmes Support Cities in Improving the Urban Environment:
A Simple Analysis of Support Modalities for the 26 Case Studies

Case Study Project or Programme	EPM Framework: Categories of Support Modalities:				
	Demonstration	Networking	Specialised Expertise	Applied Research	Capital Improvements
(1) The Localising Agenda 21 Programme of UNCHS	* *		* * *		
(2) Phuket Municipal Waste Improvement Project	* *		* * * *	* *	
(3) Revitalisation of the Parque Metropolitano (Habana)	* * *		* * * *		* * *
(4) Sustainable Sangiago Project (Chile)	* * *	* * *	* * * *	* *	
(5) *Haikou (Hainan) and Tianjin Pilot Projects* within the China Open Cities Project,	* * *	* * *	* *		
(6) Programme d→Economie Environnemental Urbaine et Populaire (PRECEUP),	* * *.	* *		* *	
(7) Recycling Nutrients through Purification of Municipal Wastewater	* * *		* *		* * *
(8) Rubbish Collection and the Environment	* *		* *		
(9) Domestic Waste Management and Recycling	* * *		* *		
(10) Urban Solid Waste Elimination and Environmental Protection project	* * *		* * *		

Case Study Project or Programme	EPM Framework: Categories of Support Modalities:				
	Demonstration	Networking	Specialised Expertise	Applied Research	Capital Improvements
(11) Gaza City Solid Waste Disposal Project			* * *		* * * *
(12) Improving Urban Transport in Dakar & Abidjan			* * * *	* *	* * *
(13) Metropolitan Environmental Improvement in Surabaya	* *		* * *		* *
(14) Development Planning for the Metropolitan Region of Santiago	* *		* * *	* *	
(15) Training Material for Urban Development	* *	* * *	* * *		
(16) The Sustainable Concepcion Project	* * *	* *	* *		
(17) Urban Environmental Planning and Management in Bangkok			* * *	* *	
(18) The Sustainable Cities Programme	* * * *	* * *	* * *		
(19) Capacity-Building for the Urban Environment		* * *	* *	* * *	
(20) Urban Waste Expertise Programme.	* *	* *	* * * *		
(21) Urban Planning and Environment Projects in South Africa			* * *	* *	
(22) ProEco Central America	* * *		* * *		
(23) Cirebon Urban Development Project	* *		* * *		* * * *
(24) *Sarhad Provincial Conservation Strategy*	* * *	* *	* *		
(25) Support Programme for Urban Rehabilitation of Shanghai	* *		* * * *		
(26) Lahore Sewer Cleaning Project	* * *		* * * *		

Note: in the table, the shading (and the number of asterisks) indicates in a general way the degree to which that project or programme (the rows of the table) fits that modality of support (the columns).

ANNEX ONE

"Case Studies" Submitted by Interest Group Members

(1) BELGIUM - Support to the *Localising Agenda 21 Programme* of UNCHS, operating initially in three secondary cities: Nakuru (Kenya), Essaouira (Morocco), and Vinh City (Vietnam). The aim of the programme is to assist each municipality to develop its own Local Agenda 21 process, and the basic approach of the programme is capacity-building to strengthen capabilities of local government in strategic planning, broad-based participation, and action planning for environmental improvement. The programme also encompasses dissemination of the lessons learned and capacities strengthened, to other towns in the region of each assisted town.

(2) CANADA - The *Phuket Municipal Waste Improvement Project* (Thailand), implemented through the International Centre for Sustainable Cities (ICSC), Vancouver. This was a demonstration project to assist the municipality and its private sector and NGO partners to make practical and visible improvements in various components of local solid waste management systems. The project supplied specialist expertise, some research support, and assistance in seeking further capital financing.

(3) CANADA - The project for *Revitalisation of the Parque Metropolitano de la Habana* (Cuba) aimed at rehabilitation (physical and environmental) of a large, run-down and polluted area (mostly non-park land) in central Havana. Project activities included small-scale demonstration works, consultancy inputs and other capacity-building efforts, and bringing together different institutions and disciplines. The focus of the project was on building capacities for strategic planning, environmental management and fund mobilisation/leveraging.

(4) CANADA - The *Sustainable Santiago* Project (Chile), aimed at transfering technology and know-how to the municipalities of the Santiago Metropolitan area in municipal environmental assessment, improving air quality through transport demand management and urban design, household and industrial waste reduction through water and energy conservation, and strengthening local capacities for participatory urban management. The project was executed in cooperation with ICLEI (International Council for Local Environmental Initiatives) and a variety of Canadian partners.

(5) CANADA - *Haikou (Hainan) and Tianjin Pilot Projects* within the China Open Cities Project, implemented by

the Federation of Canadian Municipalities. The Haikou project focused on strengthening the Environmental Protection Bureau's capacities to plan, develop, finance and manage sustainable solutions to the problems of organic waste. The Tianjin project concerned strengthening the ability of the Environmental Protection Bureau to manage and operate a consultative unit in ISO 14000 certification to assist local industries seeking certification. The project involved technical expertise from Canadian municipalities working with private sector specialist firms.

(6) EUROPEAN COMMISSION - The *Programme d'Economie Environnemental Urbaine et Populaire (PRECEUP),* working in five cities: Bogota (Colombia), Thies (Senegal), Ho Chi Minh City (Vietnam), Santo Domingo (Dominican Republic), and Sale, Khemisset and Beni Mellal (Morocco). The PRECEUP programme supports small-scale urban environmental improvement projects (waste management, sanitation, urban agriculture) at neighbourhood level in poor areas of the five cities. Working in partnership with local community groups and NGOs is emphasised, as is research to build on local operational experience and dissemination of these findings and results.

(7) EUROPEAN COMMISSION - *Recycling Nutrients through Purification of Municipal Wastewater*, working in four smaller municipalities in the State of Rio de Janeiro (Brazil): Silva Jardim, Petropolis, Cabo Frio, and Ubatuba. Low-cost facilities were built and operated to illustrate how wastewater can be purified by ponding with the nutrients being captured and reused for agriculture fertilisers, the system being suitable for areas of up to 50,000 people.

(8) EUROPEAN COMMISSION - *Rubbish Collection and the Environment*, a project working in four low-income communities in the city of Santiago (Chile). Focussing on areas in which significant numbers of poor people worked in rubbish sorting and recycling, the project helped them to establish cooperatives and to better organise their work thus combining income-support, local capacity-building and institutionalisation, and local environmental improvement through increased re-cycling.

(9) EUROPEAN COMMISSION - The *Domestic Waste Management and Recycling* project, in a low-income community in Delhi (India). The objective of the project was to improve the quality of life in low-income areas through community-based solid waste management. Working with a local NGO the project helped the local community to organise solid waste management at the household and neighbourhood levels, including public

health awareness, knowledge of small-scale composting and recycling techniques, and the organisation of the community to support these operations.

(10) EUROPEAN COMMISSION - The *Urban Solid Waste Elimination and Environmental Protection Project ("U-Sweep"),* working in two secondary cities in the Highland Region of Guatemala: Quetzaltenango and San Juan Ostuncalco. The project focussed on on strengthening the capacity of local governments to manage solid waste and to change popular attitudes about waste and the environment. The municipalities were helped to introduce and operate low-cost waste management systems, the community being brought into the process as well, with the whole set of activities being institutionalised in the local authority and the population at large.

(11) EUROPEAN COMMISSION - *Solid Waste Disposal Project,* in Gaza City (Palestine). This was primarily a capacity-building project, aimed at strengthening the capacity of Gaza municipality to effectively manage solid waste without external assistance. The project involved specialised training of municipal staff, assisting with the planning of management and operational systems, running supportive public education campaigns, and financing capital improvements in the heavy equipment needed to get the system going.

(12) FRANCE - *Improving Urban Transport in Dakar (Senegal) and Abidjan (Ivory Coast).* This is a long-term multi-phase project with an over-all aim of developing and institutionalising local policies for sustainable urban transport, integrated to include social objectives (accessibility for the poor), economic objectives (efficiency), and environmental issues (reduction of pollution, congestion, accidents, etc). The project works through transfer of knowledge between French cities and expert organisations, supporting the local partners throughout the process of study and research, plan development, formulation of specific transport alternatives, and on to operational management and capital investment.

(13) GERMANY - *Metropolitan Environmental Improvement Programme for Surabaya* (Indonesia). The programme aimed to establish effective environmental management both at the municipal level and at the community level, working in selected pilot communities through small-scale demonstration projects. The programme provided expertise to develop the environmental management systems and to undertake the demonstration projects, linking these activities to the Local Agenda 21 process of the city.

(14) GERMANY - *Development Planning for the Metropolitan Region of Santiago* (Chile). The project focussed on technical and research inputs to strengthen the local capacity for environmentally sensitive development planning. Activities included support for appraisal of infrastructure projects, formulation of environmentally appropriate planning and management guidelines, small-scale demonstration projects, information and sensitisation campaigns, and staff training.

(15) GERMANY - *Training for Local Agenda 21 Implementation* in the Philippines, Colombia, and Ecuador. In this project training materials are developed, tested and applied in the three countries; the aim is to produce distance-learning materials which can be used to train local authorities in managing urban environmental issues, particularly through a Local Agenda 21. In the pilot phase officials in 20 cities were assisted through use of the materials developed, relying particularly upon Internet communication.

(16) ITALY - Support to the *Sustainable Concepcion Project* (Chile) of UNCHS. This is a project within the global Sustainable Cities Programme and it aims to strengthen the capabilities of local government and its partners in the private and community sectors to effectively plan and manage urban and environmental development. Locally-defined priority issues are taken up and dealt with through a strategy and action-planning process, which is used to gradually develop a process of participatory environmental planning and management. Small-scale demonstration projects are supported and the whole process is to be replicated at various scales in other locales.

(17) JAPAN - *Support to Urban Environmental Planning and Management in Bangkok* (Thailand). The project provided technical expertise and applied research in support of improved environmental planning and management for the city, including GIS and remote sensing, pollution simulation, evaluation of institutional capacities, revision of development plans, and related studies.

(18) NETHERLANDS - *The Sustainable Cities Programme (SCP)* of UNCHS and UNEP. Support is given both to global operations and to city demonstration projects. The SCP operates globally, supporting demonstration projects in some 20 cities throughout the world; technical expertise, development of SCP Tools, networking among cities, documentation, and training material preparation are among the global level support activities. At the level of city demonstration projects, the SCP supports capacity-building to strengthen local partners in their capabilities for participatory and operationally-realistic environmental planning and management.

(19) NETHERLANDS - The *Capacity-Building for the Urban Environment* project, implemented in India, Peru, Bolivia and Senegal with the coordination of the Institute for Housing & Urban Development Studies (IHS).The emphasis of the project was on comparative research, training, and experience exchange, concerned with learning from experiences in urban environmental management at the city level and with developing strategies for capacity-building and replication. The project was decentralised, being headed in each country by a local partner organisation, with networking and coordination being done by IHS.

(20) NETHERLANDS - The *Urban Waste Expertise Programme*, working in Bamako (Mali), La Ceiba (Honduras), Bangalore (India) and Batangas Bay (Philippines). The programme operates mainly at the community and small-scale enterprise level, seeking to work with these partners to enable them to access, utilise and develop expertise in integrated solid waste management.

(21) SWEDEN - *Urban Planning and Environment Projects in South Africa*, working in the cities of Port Elizabeth and Kimberley. The projects focus on capacity-building for urban development planning, especially to integrate environmental management and create a more participatory and holistic approach to planning. The project provides technical expertise, training, exchange visits with Swedish municipalities, links to Local Agenda 21 activities, and back-up reports and studies.

(22) SWITZERLAND - *ProEco Central America*: a programme for reduction of urban air pollution from vehicle sources, applied in large and medium sized urban centres in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. The project focused initial attention on reduction of vehicle emissions, later integrating this with general strategies of urban planning and of modernising urban transport generally. The project emphasised concrete actions which could contribute materially to the over-all aims; it also emphasised training, public awareness, and innovative new thinking about urban transport.

(23) SWITZERLAND - The *Cirebon Urban Development Project (CUDP),* Indonesia was a long-term intervention, in three phases. The first phase focussed primarily on physical

improvements for extending water supply. Phase II took up the issues of drainage, sewerage and waste management, with an emphasis not only on physical facilities but also on institutional development. Phase Two also brought a focus on community-level participation and education, to implement small-scale projects which complement the larger infrastructure investments being made. Phase III focussed on capacity-building to ensure sustainability of improvements made, especially on community development and community participation.

(24) SWITZERLAND - The *Sarhad Provincial Conservation Strategy* (SPCS), in Pakistan, aimed at creating, in a participatory way, a strategic policy framework for regional development which would incorporate environmental as well as economic and social sustainability. During Phase I the emphasis was at the regional level (North West Frontier Province), looking at a variety of urban and rural environmental issues and developing approaches to institutional strengthening, building particularly on networking and involvement of stakeholders at various levels.

(25) UNITED KINGDOM - *Support Programme for the Urban Rehabilitation of Shanghai (SPURS)*, China. The programme aims to reduce environmental impacts caused by industrial activity and it works through technical expertise and capacity-building assistance to the municipal institutions, particular in relation to environmental monitoring, site inspection, pollution abatement methodologies, application of economic analysis and instruments, and regulatory frameworks. Low cost measures are being promoted and implemented with the collaboration of industries.

(26) UNITED KINGDOM - *Lahore Sewer Cleaning Project*, Pakistan. The project supported a pilot demonstration, in collaboration with the water and sanitation authority and with private contractors, in the clearing of 4.5 km of blocked trunk sewer lines in the dense central area of the city. Specialised expertise and training was used to help the local partners learn how to deal with the situation and in particular how to keep it from recurring. On the basis of the pilot, a rolling programme is being developed for clearing the city's whole sewer system.

Notes and references

1. The difficulty is that 'urban management' is a very broad and general topic - and one which does not lend itself readily to concrete interventions. Of course, much good work has been done in generalised capacity-building for urban management; nonetheless, it has often proved difficult to focus this work effectively on concrete achievements - or to successfully institutionalise it in the local government and civil society.

2. In many donor organisations new departments or divisions (or at least coordinating groups and mechanisms) have been created precisely to deal better with urban activities by ensuring proper collaboration across sectors and between institutions.

3. The lists in the main text give only a selection of responses, being those which were similarly reported for several different projects/programmes or those which were particularly powerful in one particular case.

4. See Chapter 3 of *Implementing the Urban Environment Agenda* (Volume 1 of the *Environmental Planning and Management (EPM) Source Book,* UNCHS and UNEP, 1997).

6. Conclusions and implications for development co-operation agencies

6.1 Key messages

Well managed urban centres are important for economic prosperity for all nations – and also for meeting social and environmental goals. Urban areas in developing countries currently concentrate some of the world's most serious environmental problems but provide the potential to combine healthy and safe living environments with resource-conserving, waste-minimising patterns of production and consumption.

Such centres – from large metropolitan centres to small market towns – house a large and growing proportion of the population in developing countries. They contain most of their industry and a high proportion of their total consumption and waste generation. *How urban areas develop and how they are managed have enormous implications for the environment (and for development) at local, regional and global level.* This document stresses how good management and planning, and the 'good governance' this requires, allows use to be made of urban areas' inherent advantages for the provision of infrastructure and services, the conservation of resources (and minimising of wastes) and the control of pollution.

Addressing urban environmental problems can also contribute much to achieving some key development co-operation goals, such as reducing poverty, increasing gender equality and making development more sustainable. In so doing, this contributes to meeting many of the commitments within such documents as Shaping the 21st Century, Agenda 21 and the Habitat Agenda.

Addressing urban environmental problems implies an emphasis on:

➡ *working in partnership* with recipient countries to support 'good governance' and this includes key roles for city and municipal authorities, citizens and their community based organisations, the private sector and NGOs, as well as for higher levels of government

➡ *supporting local processes* to identify and act on environmental problems which are accountable, democratic and participatory – which also allows external agency support to be respond appropriately to the great diversity between urban centres in the scale and nature of the problems and their immediate and underlying causes

➡ *a preventative approach* for all environmental hazards along with particular attention paid to protecting those whose age, income, occupation or daily tasks make them most vulnerable to such hazards. A focus on prevention implies a long term shift in production away from 'end of pipe' pollution control to low-waste or even zero emission production systems.

➡ *integrating environmental health issues (often called the 'brown' agenda) with a respect for ecological issues which include resource-conservation and waste reduction (often referred to as the 'green' agenda).*

➡ ensuring that *urban environmental interventions enhance other development co-operation agency goals* including a commitment to gender equality and to the needs and rights of children

➡ *reducing the transfer of environmental costs* arising from urban based production and consumption to other people and other eco-systems, both now and in the future. This includes supporting 'good governance' beyond urban boundaries – perhaps especially for ensuring collaboration between urban governments and the governments in whose jurisdictions urban environmental impacts are concentrated – for instance in watersheds that are outside urban boundaries.

➡ *ensuring an appropriate national framework* to support the above, with the legislative and economic instruments that are needed and with urban environmental concerns integrated into macro-economic policy and other key national economic, social and environmental policies. This can include a stress on adapting legislative and economic instruments that have been used successfully in OECD countries.

➡ *recognising the value of voluntary and persuasive instruments.* This can include: encouraging businesses and local authorities to adopt codes of good environmental practice and have regular environmental audits; the use of public information to encourage good practice (for instance highlighting examples of firms or local authorities that greatly reduced emissions/wastes) and discourage bad practice; and support for participatory processes that involve all stakeholders in developing consensus about environmental goals and actions (for instance through local agenda 21s).

6.2 Objectives

The overall objective is to ensure that critical urban environmental problems are resolved as part of a long term commitment to ensuring that urban development contributes to the achievement of sustainable development goals. This means that environmental aspects, including impacts at local, regional and global levels, need to be considered in all urban development interventions.

It suggests the need to maximise the urban contribution to sustainable development by:

➡ improving the health, safety and productivity of urban environments;

➡ reducing the environmental burdens that urban-based production and consumption transfer beyond their boundaries, for both present and future generations; and

➡ (where appropriate) building upon the synergies (and avoiding the conflicts) between poverty reduction and environmental improvement.

6.3 Priority Areas

The review of urban environmental problems suggests certain priorities for particular sectors and cross-cutting themes, although the relative importance of these sectoral and cross-cutting issues will vary greatly between nations and even between urban centres within each nation.

WATER, SANITATION, DRAINAGE AND SOLID WASTE MANAGEMENT: Improved provision for water, sanitation and drainage (along with better solid waste management and primary health care) in unserved or inadequately served urban areas can transform people's health. Improved provision is much helped by technological and institutional innovations which reduce costs and make full cost payment easier for low income groups. Improved provision can be made within a resource-conserving framework which encourages waste minimisation.
Within this, *more attention needs to be given to sanitation*. The urban poor are often short-changed for sanitation and drainage within water and sanitation projects – perhaps because this seems to be the easiest way for external providers to keep down unit costs. Large population concentrations and high population densities make good provision for excreta disposal especially important. There are a range of options for improved sanitation which include more 'ecological' systems (including a range of dry latrines and also neighbourhood shallow sewer systems with their own treatment system) which allow the nutrients to be returned to the soil. But care is needed not to promote systems which are inappropriate to particular circumstances or which compromise the health aspects.

In supporting improved solid waste management, attention is needed to solutions which promote waste reduction, reuse, repair and recycling in ways which also reduce environmental hazards for those involved in the 'waste' economy and also strengthen their livelihoods

LIVELIHOODS – INCREASING INCOMES FOR POORER URBAN GROUPS: Environmental improvements can be combined with **more adequate, stable and safer livelihoods for low income groups** – for instance through appropriate support for labour-intensive public works to build, improve of maintain environmental infrastructure, or develop urban agriculture or waste-reduction or re-use.

HOUSING: Supporting low income groups to acquire, build or develop better quality housing with adequate provision for basic infrastructure and services can help transform urban environments for such groups. Many innovative programmes which include the use of savings and credit have shown the enormous benefits these can bring at relatively low cost and with good potential for cost recovery.

TRANSPORT: More attention is needed to increasing the quality and reducing the cost of *public transport* within a broader transport planning and management framework which seek to reduce traffic accidents, discourage urban sprawl, keep down automobile dependence and control the use of highly polluting road vehicles. This also brings benefits in reduced greenhouse gas emissions and reduced urban air pollution.

HEALTH: Improved primary health care has an important role in reducing the health impact of many environmental hazards. Most donors have concentrated their support for primary health care in rural areas.

URBAN PRODUCTION AND POLLUTION CONTROL: Support for more prosperous urban production systems must include a commitment to minimising environmental hazards and the transfer of environmental costs. In many urban centres, particular attention needs to be paid to the occupational health and safety and the wider environmental impacts of small scale 'informal' production units.

ENERGY: Support for energy conservation can often bring benefits to urban, regional and global environments. This generally requires cross-sector approaches – for instance linking transport and land use planning and urban design with changes in planning and building control standards. In many urban areas, attention is also needed to reducing indoor air pollution, especially for lower income groups.

DISASTER PREPAREDNESS: In many urban centres, greater attention to *disaster preparedness* is needed, and this should be integrated within a broader commitment to reducing the urban population's vulnerability to all environmental hazards, including those posed by disasters.

THE URBAN ENVIRONMENT AND NATURAL RESOURCES: Staff within urban departments should work with environment departments to examine where and how each donor's involvement in urban investment, management and planning can help maintain eco-cycles and meet other environmental goals – for instance protecting soils, forests and biodiversity, promoting good practice in freshwater use and management, and ensuring development patterns which minimise greenhouse gas emissions. One key broader goal is to increase the recovery and reuse of resources currently lost in urban waste streams, especially key resources (for instance phosphorus) for which supplies are constrained.

GENDER EQUALITY: More attention should be paid to *the environmental needs of women* within the broader framework for promoting gender equality. All development co-operation agencies face difficulties in ensuring that the needs and priorities of women are adequately represented in the initiatives they support, especially in societies where gender discrimination limits possibilities for women in decision-making at all levels and in access to employment, housing and credit.

CHILDREN'S NEEDS AND PRIORITIES: Safe, supportive, stimulating physical environments contribute greatly to children's health, cognitive growth and social development. Children of different ages have very particular environmental needs which are essential for their physical, mental and social development. And as stressed earlier, they are more vulnerable to environmental hazards. Development co-operation agencies must seek ways to ensure children's environmental needs are understood and acted on in all urban interventions.

COUNTRY PROGRAMMES: *Consider expanding the range of countries to which support is provided.* It is important to support urban initiatives in countries where urban authorities have become more democratic and supported by appropriate decentralisation programmes.

6.4 Instruments

➡ *Support for institutional development and for working in partnerships.* Development co-operation for the urban environment needs to support increased capacity for urban environmental investment, management and planning at national, regional and local levels and to respond better to local needs, priorities and potentials. This is elaborated in more detail below. It also needs to support the development of appropriate legislative and regulatory frameworks, including those that encourage and support appropriate private sector roles.

➡ *Funding within a capacity enhancing framework.* More investment is needed in the priority areas noted above but this will achieve little unless it enhances and supports local investments (by households, communities, businesses and all levels of government) and strengthens local and national capacity to get key investments made and maintained, within the appropriate planning framework. One of the great potentials evident in many urban centres is this combination of lower unit costs and a greater willingness and capacity of households and businesses to pay for environmental infrastructure (and other aspects of good environmental management). 'Good urban governance' can ensure that environmental investments coincide more with the priorities of citizens and businesses and can keep down costs (so there is more scope for cost-recovery).

The stress on cross-sector collaboration and building capacity within countries for environmental investment, planning and management does not remove the role of single-sector projects. Water supply systems, water treatment plants, drainage systems, power stations........ are still needed but they must be designed and implemented within this broader environment-aware, 'strengthen local capacity' framework.

'Good environmental practice' which ensures healthier and safer urban environments within resource-conserving, waste-minimising frameworks needs to be applied to all urban interventions, not only those that address urban poor groups. These include the larger projects for environmental infrastructure improvements and other projects which are not 'environmental' yet have important implications for the environment within or around urban centres (for instance power stations, solid waste disposal sites, ports, and airports).

➡ *Mechanisms within each agency for improved practice.* All development co-operation agencies are supporting many projects that take place in urban areas even if some have no urban policy or urban department. In many, there is a need to strengthen the capacity to address urban environmental problems. There is often a need to enhance the means to support cross sector collaboration and to develop a clear system of institutional learning. This implies that agencies might:

- Consider ways to increase the effectiveness of cross-sector collaboration within each development co-operation agency and across all such agencies – for instance to ensure greater collaboration between all the donor-supported interventions in each particular city. The possibility of such cross-sector collaboration is much enhanced by effective city governments with the kinds of environmental action plans or local agenda 21s outlined earlier which can provide the framework within which different donor agencies can work together

- Ensure that each development co-operation agency has a clear system of "institutional learning" for its involvement in the urban environment so that its existing and new experiences working in urban areas are shared and disseminated within the agency. This includes the need to carefully evaluate urban work, document experience and ensure this feeds into the agency's evolving urban policy.

- Consider whether all OECD development co-operation agencies might not benefit from a more structured and regular sharing of their experiences in supporting urban environmental interventions, including addressing the issues raised above.

6.5 Partnerships in Urban Environmental Management

➡ *National and regional levels of government*
Better practice in environmental investment, management and planning at metropolitan, city and urban district level requires an appropriate institutional, legislative and policy framework at higher levels of government. Development co-operation agencies should consider the means by which they can work with partner governments and other groups to support:
- the development of good urban environmental policy at national and regional levels and the policy instruments needed to make this effective;
- the integration of urban environmental investment, planning and management within national sustainable development strategies. This includes ensuring sufficient attention by urban authorities to regional and national environmental priorities such as protecting areas which have particular ecological importance and keeping down greenhouse gas emissions.
- developing the appropriate *legislative and regulatory framework* that supports initiatives by urban authorities, private sector bodies and civil society to develop and implement environmental action plans or local agenda 21s or contribute in other ways to environmental improvements
- decentralisation and other policies or programmes which strengthen the capacity of urban governments to meet their environmental responsibilities and ensure environmental problems are addressed

➡ *Key local actors and their support needs*

6.6 Urban authorities

➡ developing the capacity of local authorities for *environmental investment, management and planning*. This is needed to ensure more effective responses to environmental health problems and to land use and management within urban boundaries but within a resource conserving, waste-minimising framework that also limits detrimental environmental impacts beyond urban boundaries. This is, in effect, to support "good environmental governance" with its commitment to participation, demand management, efficient use of natural resources, subsidiarity and an appropriate blending of regulatory and market reforms.

➡ supporting the means to achieve the above. This includes support for urban authorities and civil society groups to develop and implement *local agenda 21s* which seek to increase transparency, accountability and the involvement of all stakeholders, especially low income groups and those who are most at risk from environmental hazards. This also includes supporting local authorities to identify

environmental capacities, risks and tolerances, linked to action plans with regular evaluation and to anticipate and counter potential adverse policy impacts. It includes supporting the capacity of local authorities to use the appropriate mix of regulatory and market tools.

➡ developing *more effective regulatory systems* built around more effective monitoring and strong public consensus for, for instance, ensuring adequate quality and coverage in infrastructure and service provision (by public, private and other agencies), occupational health and safety, pollution control and waste management

➡ as a key part of the above, support innovation in *the collection and management of solid and liquid wastes*, building in, where appropriate, reduced material consumption and re-use, reclaim or recycle.

➡ develop *accessible information* bases so that all citizens have access to information about the conditions of the local environment, including ways to influence the local political systems and ways to improve the state of the local environment which can be pursued by individuals, communities, and businesses. This can be linked to improved environmental monitoring and environmental education.

➡ supporting *a greater dissemination* of successful experiences among other local governments

6.7 Support good practice within private sector

This includes:

➡ frameworks to encourage private investment in infrastructure and service provision and ensure good practice among privatised provision including a commitment to universal coverage, demand management, accountability, and keeping down prices.

➡ frameworks to encourage clean production systems, waste reduction, environmental responsibility and other aspects of good environmental practice among all enterprises. Some private sector firms have taken the lead in a commitment to more environmental responsibility and to regular environmental audits of their operations.

6.8 Support key roles of other 'civil society' groups

➡ Recognise the important role taken by NGOs, community organisations and other groups within 'civil society' in addressing urban environmental problems. Many of the

most innovative and cost-effective responses to the environmental priorities of low income groups have been developed by local NGOs. Local NGOs have often had important roles in developing local agenda 21s while national NGOs have often had key roles in raising environmental awareness and promoting environmental policies.

➨ C*onsider new means by which innovative NGO initiatives can receive support.* The fact that many of the most innovative responses to environmental improvements for low income groups have come from local NGOs suggests the need for donors to consider how to expand such support. In some instances, NGO innovations have also catalysed significant changes in government policy, with NGO staff being drawn into government to help implement them. There is already a considerably body of experience on this, as some bilateral donors have long-established urban programmes in which local NGOs have critical roles

– including some which work closely with local and central governments. However, NGOs must also meet the criteria of 'good governance' (including accountability, transparency and working in participatory ways).

➨ *Ensure that the needs and priorities of urban poor groups are fully represented in debates about urban environmental policies and priorities and support such groups' capacity to negotiate more appropriate solutions for themselves.* Local NGOs often have important roles in working with urban poor groups to negotiate infrastructure provision, resources, services or cost-reductions from public or private infrastructure and service providers. It is also important to ensure that the needs and priorities of urban poor groups are met within the rapidly changing institutional contexts which often include a greater emphasis on cost-recovery, demand management and privatisation.