

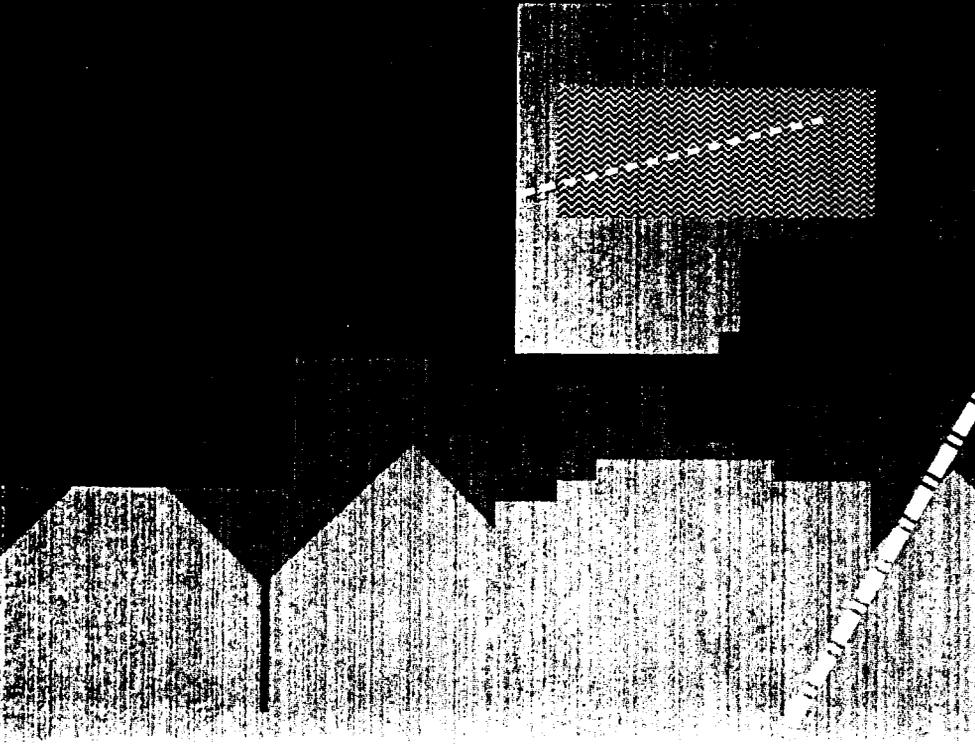


Urban Management Programme

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Land Use Considerations in Urban Environmental Management

Janis D. Bernstein



12



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Urban Management Programme

**Urban Management and the Environment**

**12**

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Urban Environmental Management**

Janis D. Bernstein

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The Urban Management Programme (UMP) represents a major approach by the United Nations family of organizations, together with external support agencies (ESAs), to strengthen the contribution that cities and towns in developing countries make towards economic growth, social development, and the alleviation of poverty. The program seeks to develop and promote appropriate policies and tools for municipal finance and administration, land management, infrastructure management, and environmental management. Through a capacity building component, the UMP plans to establish an effective partnership with national, regional, and global networks and ESAs in applied research, dissemination of information, and experiences of best practices and promising options.

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## FOREWORD

This paper has been prepared for the Urban Management and Environment component of the joint UNDP/UNCHS/World Bank—Urban Management Programme (UMP). The UMP represents a major coordinated approach by the United Nations family of organizations, together with external support agencies (ESAs), to strengthen the contribution that cities and towns in developing countries make towards economic growth, social development, and the alleviation of poverty. The program seeks to develop and promote appropriate policies and tools for environmental management, land management, infrastructure management, poverty alleviation, and municipal finance and administration. Through a capacity building component, the UMP plans to establish an effective partnership with national, regional, and global networks and ESAs in applied research, dissemination of information, and experiences of best practices and promising options.

This paper is one in a series of discussion papers that has been used, in combination with case studies and research, to develop an overall report on formulating environmental strategies for cities. Other papers in the series cover regulatory and economic instruments for waste management and pollution control, priorities for urban waste management and pollution control, energy/environmental linkages in the urban sector, and rapid urban environmental assessment. Each paper provides background information on key urban development and environment linkages and/or suggest elements of an environmental management strategy for cities in the developing world. In addition, research reports have been prepared on the following topics: health impacts of urban environmental problems, economic spillover effects of urban environmental problems, the application of remote sensing and geographic information systems to urban environmental planning, privatization of municipal solid waste services, and local management of wastes from small-scale and cottage industries. Finally, case studies on priority urban environmental problems have been prepared for Accra, Jakarta, Katowice, Sao Paulo, the Singrauli region of India, Tianjin, and Tunis. A list of background publications is presented in Annex B.

Phase 2 of the UMP (1992-96) is concerned with capacity building at both the country and regional levels and with facilitating national and municipal dialogue on policy and program options. It emphasizes a participatory structure that draws on the strengths of developing country experts and expedites the dissemination of that expertise at the local, national, regional, and global levels.

Through its regional offices in Africa, the Arab States, Asia and the Pacific, and Latin America and the Caribbean, the UMP seeks to strengthen urban management by harnessing the skills and strategies of regional experts, communities, and organizations in the private sector.

Regional coordinators use these networks to address the five programme themes in two ways:

- **City and country consultations.** The UMP brings together national and local authorities, private-sector networks, community representatives, and other actors to discuss specific problems within the UMP's subject areas and to propose reasoned solutions. Consultations are held at the request of a country or city, and often provide a forum for discussion of a cross-section of issues.

- **Technical cooperation.** To sustain follow-up to the consultations, the UMP uses its regional networks of expertise to provide technical advice and cooperation.

Through its nucleus team in Nairobi and Washington, D.C., the UMP supports its regional programmes and networks by synthesizing lessons learned, conducting state-of-the-art research, and supporting dissemination of programme related materials.

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## **ABSTRACT**

In rapidly growing developing country cities, distorted land markets and ineffective urban land management often have resulted in the degradation of environmentally fragile land; occupation of hazard-prone areas; loss of cultural resources, open space, and prime agricultural land; and excessive urban sprawl. To prevent further degradation, governments should exert some degree of control over urban land use and development, but not unnecessarily constrain the supply of land for housing or discourage the private sector from providing affordable housing in safe locations. An important challenge is to achieve a balance between urban development and environmental protection, taking into account linkages among land use, poverty, and the environment.

Balancing environmental and economic objectives requires a land management strategy that facilitates the land market and protects sensitive land and cultural resources. Implementing such a strategy requires a mix of policies and locally appropriate instruments (regulatory, economic, property rights, acquisition, government provision of infrastructure, and information and education) to guide and motivate the behavior of actors causing land degradation problems and those responsible for managing urban land to avoid these problems. The paper presents the most promising land management approaches and instruments for protecting sensitive resources, managing hazard-prone areas, protecting cultural resources, conserving open space, discouraging excessive urban sprawl, and managing prime agricultural land.

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# EXECUTIVE SUMMARY

## Introduction

i. Third World cities are growing at unprecedented rates. Since 1950, the urban population in these cities rose from under 300 million to 1.3 billion persons (World Bank 1991). By the year 2030, developing country cities are expected to grow by 160 percent. Although the urbanization process often means accelerated economic performance for a country, the accompanying increases in urban land prices as well as the conversion of land—whether that land lies within or outside the existing urbanized area—may have negative implications for natural and cultural resources as well as the urban poor.

ii. As demand for limited supplies of urban land rises, for example, low-income groups may be forced to occupy illegal unserviced subdivisions often on the periphery of cities, where the land tends to be most vulnerable to both natural and man-made hazards. The urbanization process also may exert pressure on sensitive ecosystems. Within existing built-up areas of cities, uncontrolled growth and inadequate infrastructure may cause irreversible losses of cultural resources and open space. Poorly managed development also may cause excessive urban sprawl and negative impacts on air quality, energy consumption, and aesthetic quality. The conversion of prime agricultural land to urban use may increase costs for locating, storing, and purchasing food.

iii. The purpose of this paper is to discuss pressing environmental risks associated with urban land use, the factors that perpetuate these problems in developing country cities, and available land management strategies and instruments for addressing them. It also is intended to provide expanded information and guidance related to the land use aspects of the urban environmental planning and management process presented in *Toward Environmental Strategies for Cities: A Framework for Urban Environmental Management in Developing Countries* (Bartone, Bernstein, Leitmann 1993). The paper is directed primarily to urban policy makers and land managers working at the technical level as well as other professionals responsible for designing or influencing land management policies or strategies in Third World cities.

## Factors That Perpetuate Land Use Problems

iv. In most Third World cities, distorted land markets and inadequate management of land and environmental resources—both of which are exacerbated by rapid urban growth—have caused to varying degrees the environmental problems discussed above. The six key factors that account for continued resource degradation, occupation of hazard-prone areas, and excessive urban sprawl are: inappropriate regulation, lack of tenure security, inadequate infrastructure capacity, inadequate information, inappropriate pricing and taxation, and weak institutions and poorly coordinated actors in the land market.

### *Inappropriate regulation*

v. The most important factor accounting for losses of natural and cultural resources as well as the occupation of hazard-prone land is inappropriate regulation. In many cases, the problem lies

in excessive regulation whereby land development standards reduce the supply of affordable serviced urban land by requiring large lot sizes or excessive amounts of land for circulation. These standards raise the costs of safe housing beyond the reach of low-income groups, who are then forced to seek housing in illegal settlements, often located in hazard-prone areas. In India, for example, the Madhya Pradesh land use regulations established development standards that were affordable to only the wealthiest 20 percent of the households. Because they could not afford such formal housing (or the transport costs to locate elsewhere), the victims of the 1984 Bhopal chemical accident were forced to live in the squatter settlements located near the Union Carbide factory.

vi. In many countries, excessive land survey regulations, titling requirements, and subdivision approval requirements present costly bottlenecks in acquiring and developing land. The time and costs involved in resolving disputes and obtaining clear title lead many households to obtain land and housing in informal settlements or subdivisions, often located on hazard-prone lands. In Kuala Lumpur, Malaysia, for example, stringent development standards and complicated time-consuming procedures to obtain the necessary subdivision approvals from about 55 separate government departments were principal factors accounting for the increase in new housing prices by 3 to 4 times the annual income of a typical urban household in the 1970s to 5.5 to 7 times the average annual income in the 1980s. During the same period in Bangkok, Thailand, where the entire subdivision approval process takes approximately 100 days, the price of housing in relation to annual income fell over the same period from roughly 5 times the annual income in the 1970s to about 2.5 times the annual income in the mid-1980s.

vii. In other situations, inadequate regulation is responsible for resource degradation and the occupation of hazard-prone lands. Many governments have not formulated effective land use policies, laws, and standards that address development in sensitive or hazardous areas or have not adequately enforced existing regulations. In Morocco, for example, the government declared certain portions of Rabat off limits for permanent housing because they were located on the steep slopes and adjacent salt marshes bordering the river that divides Rabat and Sale. Because these lands could not be used for "higher" purposes, the regulation essentially directed squatters right to them. In other cases, numerous codes and ordinances have been adopted from developed countries, which have very different land and construction conditions. These regulations usually are unenforceable because they are unrealistic or have been formulated without consultation with public or private interests and therefore lack political acceptance and adequate incentives.

### ***Inadequate information***

viii. Another severe constraint on land management as well as environmental planning, property taxation, and hazard mitigation is the lack of adequate data and maps. Without information on the resources to be managed, it is extremely difficult, if not impossible, for local authorities to establish effective regulations and policies that affect hazard-prone areas or sensitive land and cultural resources. Similarly, the lack of timely and accurate data necessary for land transactions seriously constrains the land market. Inadequate tax rolls have direct implications for financing urban services and thus expanding the supply of serviced land in the formal market. Lack of financial resources also means that existing services cannot be properly maintained, thus increasing the vulnerability of land in hazard-prone areas. In addition to inadequate data, most developing countries

also lack capacity in data interpretation. This inhibits the formulation and implementation of land management strategies as well as environmental impact assessments of proposed development projects.

#### ***Lack of tenure security***

ix. The pervasive lack of secure tenure and poor titling and land registration systems in many developing countries poses a considerable constraint on urban land markets and therefore has a profound effect on the ability of the poor to acquire safe land for housing. One of the major implications of poor titling and land registration systems is the inability of landowners to gain access to formal credit sources because they cannot use their property as collateral. In most situations, banks will not provide loans for home improvements without a clear title. Further, without secure tenure, residents have little incentive to maintain their dwellings or invest in improvements, thereby increasing the vulnerability of the area to floods, earthquakes, and other hazards.

#### ***Inadequate infrastructure capacity***

x. The lack of adequate infrastructure is another principal factor accounting for the degradation of natural and cultural resources. Few rapidly growing cities can meet the demand for services. In the squatter communities or illegal subdivisions located in hazard-prone lands, inadequate infrastructure and services make the land as well as its inhabitants particularly vulnerable. In the event of a flood, for example, accumulated garbage and human waste flowing through an area can have tragic implications for human health. The lack of adequate roads impedes access of emergency vehicles to these areas. In the case of cultural resources, inadequate wastewater disposal and drainage systems often result in substantial damage to historic properties. The inability of local governments to provide the necessary infrastructure and services is due in large part to its failure to consider appropriate technology as well as its deficient management practices and inability to mobilize the necessary financial resources.

#### ***Inappropriate pricing and taxation***

xi. Because many of the benefits of conserving sensitive land resources (that is, wetlands and coastal areas) are difficult to measure, the value of conservation rather than development often is under-estimated. Consequently, the costs of protection in terms of development opportunities that must be given up, as well as government expenditures to acquire and manage a protected area, appear considerable. As a result, a smaller amount of land is protected than there would be if there was a full accounting of all the benefits and costs associated with each alternative land use. In the case of protecting cultural resources, the costs of protection are usually easy to quantify, while the benefits of preserving cultural resources are generally under-valued. In many cities, therefore, property owners view tearing down historic properties and building new structures as more profitable than rehabilitation and reuse although the latter approach may be equally profitable.

xii. Inefficient tax policies are significant factors encouraging urban sprawl. For example, low or non-existent property taxes and the absence of development fees or special assessments to cover the cost of publicly provided infrastructure not only subsidize the landowner but they enable landowners to tie up parcels of land unproductively at relatively low cost to themselves, while forcing

the government and their neighbors to assume additional costs of extending infrastructure to pay for urban sprawl. Due to inadequate taxation systems, most developing country cities also do not have sufficient resources to finance urban services as well as improved land titling and registration systems. In addition, local governments have not applied effective policies for collecting development fees, exactions, user charges, or other charges that could finance new or improved services and thus expand the supply of serviced land.

***Weak institutions and poorly coordinated actors in the land market***

xiii. Lastly, weak institutional capacity undermines most government efforts to manage urban land and cultural resources effectively. This encompasses lack of expertise in environmental planning and management, inadequate financial resources, and inadequate or lack of private sector and community involvement. Moreover, in many countries, there can be many land management institutions that formulate plans or policies or make investments in urban land. National land administration agencies, state planning departments, urban development or municipal housing authorities, land development agencies, and urban planning officials all have roles in determining the use of sensitive land and cultural resources. To further complicate this situation, there are traditional authorities as well as private organizations that are significant actors in urban land markets and the provision of housing. In most countries, however, there is no coordination among these actors; the entity making the plans often is not the one making decisions about public investments and private development.

**Need for Integrated Land Management Strategy**

xiv. Notwithstanding the failures of government interventions in urban land markets, some degree of government control must be exerted over urban land use and development. Without effective policies and regulations, it is unlikely that private actors in the land market will take into account the costs that their decisions concerning the use, density, design, location, and timing of development may impose on sensitive land and cultural resources. At the same time, government policies and regulations should not prevent the private sector from providing affordable housing for low-income populations in safe locations—or impose development restrictions that unnecessarily constrain the supply of residential land. For cities undergoing rapid expansion, therefore, one of the most important challenges is to achieve a proper balance between urban development and environmental protection.

***Strategies for balancing environmental protection and urban development***

xv. Balancing environmental and urban development objectives requires a two-prong urban land management strategy designed to facilitate land markets as well as protect priority land and cultural resources. The two components of this strategy are:

- **Protect priority resources.** Protecting priority land and cultural resources involves 1) restricting development in specific areas through special controls, development standards, or special taxes—coupled with effective enforcement,

and when necessary, designation and servicing of alternative locations; 2) allowing or encouraging appropriate or acceptable use of sensitive land or cultural property accompanied by the necessary impact mitigation measures and management controls; 3) encouraging preservation through tax incentives; and 4) improving citywide environmental management (that is, providing effective urban infrastructure and services so as to minimize externalities as well as guide development to environmentally suitable land).

- **Facilitate the land market.** Although the nature of the land market or resource management problems in an urban area will determine the most effective approach, improving the functioning of the land market so as to promote resource protection involves 1) providing infrastructure so as to reduce developers' risk and encourage high density development where desirable and 2) formulating regulations that are appropriate to local conditions, establish flexible development standards, and involve a minimum of administrative requirements.

xvi. To implement such a two-prong strategy, there is no one set of policies and policy instruments that will be effective under all conditions. Planners and policy makers in each city should evaluate their own local land use-related problems—and through an extensive participatory planning process—negotiate priorities and formulate locally appropriate strategies, policies, and investments, taking into account the interests of a wide range of public and private actors in the land market and the costs and benefits of each approach to both public and private sectors. Although the land use-related problems in a city will vary according to the physical, demographic, cultural, and economic conditions of a particular setting as well as the needs, roles, and capabilities of many public and private actors in the land market, the following highlights the most promising approaches to managing sensitive and hazard-prone land, cultural resources, agricultural land, and urban sprawl.

#### ***Protect sensitive land resources***

- Improve citywide environmental management to minimize environmental externalities threatening natural resources.
- Establish buffer zones to minimize encroachment of activities that will threaten resources.
- Allow development or redevelopment of some critical zones accompanied by the necessary impact mitigation measures.
- Guide development to environmentally appropriate sites, while banning development on land where that development will cause irreversible impacts to significant natural resources.
- Where necessary, relocate households occupying environmentally fragile land to serviced land near employment and provide appropriate compensation.

***Manage hazard-prone areas***

- Improve citywide environmental management to reduce vulnerability of hazard-prone areas.
- Clarify land tenure to encourage investments in housing and infrastructure improvements that will withstand hazards.
- Allow appropriate use of hazard-prone areas provided that the necessary management controls are in place (for example, the land adjacent to heavy industry should be used for light industry or commercial establishments, and in some cases, parks and other open space uses).
- Ban development where hazardous conditions cannot be mitigated through appropriate infrastructure development or other measures (for example, building codes).
- Wherever there are land restrictions, carry out the necessary enforcement measures and service alternative sites (or increase allowable densities in existing urbanized areas) to ensure that new migrants do not take the place of the relocated groups.

***Protect cultural resources***

- Register and protect priority historic buildings, landmarks, or districts.
- Establish flexible controls on the uses of historic buildings so as to encourage adaptive reuse and ensure preservation.
- Clarify land tenure and register properties in the legal cadastre to enable owners to obtain loans or credits for investments in building improvements.

***Conserve open space***

- Where identified as a pressing environmental problem, preserve open space to meet minimum needs for recreation, drainage, or other urban purpose by designating land as parks or protected areas and apply the necessary management controls to prevent encroachment of non-conforming land uses.

***Discourage excessive urban sprawl***

- Clarify land tenure and implement other regulatory reforms that would expand housing opportunities in existing urbanized areas (for example, increase allowable densities in existing urbanized areas, encourage historic property preservation and rehabilitation, streamline the development approval process).
- Establish rights-of-way for primary infrastructure to guide new development.

### ***Manage prime agricultural land***

xvii. The measures to discourage urban sprawl are the principal means for either avoiding the loss of prime agricultural land or promoting the orderly conversion of agricultural land to urban use. Additional restrictions are not recommended (there is no evidence that any country has successfully limited land conversion without creating serious inflationary pressure on land prices for other uses). In most cases, the loss of agricultural land can be compensated for increasing the productivity of remaining farms, investing in the cultivation of new agricultural areas, or increasing food imports.

xviii. Implementing these land management approaches requires a mix of policies and instruments to guide and motivate the behavior of actors causing land degradation problems and those responsible for managing urban land so as to avoid them. Some of these instruments will influence market behavior (for example, increasing the land supply by removing excessive land use controls or improving land titling systems); others will affect the land management process through improved regulation, subsidies, or provision of information. The range of instruments fall into six basic categories:

- **Regulatory instruments.** These include zoning, subdivision regulations, transfer of development rights, and other types of land use controls designed to protect sensitive land resources, public interests, and environmental and cultural values;
- **Economic instruments.** These include economic incentives such as preferential taxation schemes, transfer and development taxes, and subsidies, all of which can be used to encourage developers and landowners to develop (or keep in natural state) land in accordance with environmental objectives;
- **Land acquisition alternatives.** These include various types of land acquisition approaches, such as voluntary sales, expropriation, easements, and land exchanges, that will enable urban land managers to meet conservation objectives;
- **Property rights.** This approach involves the provision of secure land tenure to promote investment in housing and infrastructure improvements;
- **Government provision of infrastructure.** This approach involves the provision of appropriate infrastructure to guide development as well as to serve the special needs of land resources or hazard-prone areas; and
- **Information and education.** These are methods for expanding knowledge of the issues, land conditions, and the environmental implications of various types of development on sensitive or hazard-prone lands. They can be used to support land use decisions and to encourage landowners and public authorities to carry out voluntary conservation. They include land information systems, various types of assessments, and public information.

xix. No single instrument will be effective in achieving all land management objectives. The choice of instruments should be matched to the special characteristics of each problem and locality,

the specific actor in the land market whose behavior needs changing, and the desired behavioral response. In determining the most appropriate instruments, urban land managers will need to assess such factors as existing and planned land uses, existing land use and other applicable controls that may or may not be appropriate or effectively enforced, existing rates of land conversion, and the extent of the urban or peri-urban land area requiring special protection. In addition, urban land managers will need to take into account local attitudes and interests; existing legal authorities and institutional capacities; prevailing economic and market conditions; the costs and benefits of alternative strategies for all actors; questions of efficiency, equity, and adaptability; available means for conflict resolution; and political constraints.

***Building land management capacity***

xx. Formulating and implementing land management strategies require a wide range of actions and capabilities from various public and private actors in urban land markets. Unfortunately, local agencies in many Third World cities lack the skills to adequately assess alternative strategies and communicate the tradeoffs to decision makers. Further, most Third World cities lack the necessary information for effectively carrying out most of the available land management strategies and tools. In developing any kind of strategic approach to land management, therefore, each city will need to build up its capabilities in formulating as well as assessing alternative management approaches, establishing clear institutional arrangements, encouraging public participation in the planning and decision-making processes, and building broad-based support.

## I. BACKGROUND

1.1 Urbanization and urban land use decisions are critical determinants of environmental quality. In Third World countries, where cities are growing at unprecedented rates, distorted land markets and ineffective urban land management practices have resulted in the degradation of environmentally fragile resources; occupation of hazard-prone areas (for example, steep slopes, flood plains, vacant land adjacent to polluting industries or waste disposal sites); loss of cultural resources, open space, and prime agricultural land; and excessive urban sprawl. In cities, which are the principal generators of economic growth in developing countries, effective urban land management is needed to balance environmental protection, economic development, and meeting basic needs for housing the poor. Given the scarcity of urban land, important tradeoffs will have to be made in land allocation.

### **Purpose and Organization of Paper**

1.2 The purpose of this paper is to discuss the nature of pressing environmental problems associated with urban land use and to explore the various strategies and instruments available to urban land managers for achieving specific environmental objectives. Additionally, it is intended to provide expanded information and guidance related to the land use aspects of the urban environmental planning and management process presented in *Environmental Strategies for Cities: A Framework for Urban Environmental Management in Developing Countries* (Bartone et al. 1993). It is directed primarily to urban planners and land managers working at the technical level, as well as other professionals responsible for influencing or designing urban land management policies and strategies in developing country cities.

1.3 The paper is presented in four chapters. The remainder of Chapter One presents a brief overview of urbanization trends and the environmental aspects of the urban land situation in most Third World countries. Chapter Two summarizes the principal environmental problems associated with urban land use—land degradation, occupation of hazard-prone lands, loss of cultural resources and open space, loss of prime agricultural land, and excessive urban sprawl. Chapter Three examines the principal factors that perpetuate these problems in most developing country cities. In Chapter Four, the paper presents alternative land management approaches to balance environmental protection, urban development, and low-income housing objectives. Chapter Five presents conclusions and suggestions for further research. Annex I highlights specific land management instruments that can be used to achieve various environmental objectives. Annex II lists additional UMP papers that relate to this topic.

### **Urbanization and the Environmental Dimensions of the Urban Land Crisis**

1.4 Third World cities are growing at unprecedented rates. Since 1950, urban population has increased from under 300 million to 1.3 billion people (World Bank 1991). By the year 2030, this population is expected to grow by 160 percent. By the year 2000, 21 cities in the world will have more than 10 million inhabitants; 17 of these cities will be in developing countries (World Bank 1992). World population, therefore, will shift from being predominantly rural to predominantly urban around the turn of the century. Another striking trend is the steady increase in the number of large cities in developing countries. Presently half of the urban population is located in some 394 cities,

each having populations of over half a million. At the beginning of the next century, there will be over 500 cities of this size, many that will have become major metropolitan areas.

1.5 In most countries, the expansion of urban population has caused and will continue to generate a rapid rise in the demand for urban land for residential plots for all income groups, locations for industry and commerce, and land for public buildings and projects. The projected increase of the built-up urban areas between now and the end of the century is estimated to be around 118 percent (UNCHS 1987). Due to the many competing claims for urban land as well as the consequent rise in land prices, supplying urban land which can be developed at the pace and scale required as well as making decisions about the use of that land is a formidable challenge for most developing country cities.

1.6 As pressure for urban development intensifies, agricultural land on the peripheries of cities is being converted to urban use. In Jabotabek (an area that includes all of Jakarta and the urban areas of the Kabupatens of Bogor, Bekasi Karawang, and Tangerang), urban land is expected to expand by 17 percent during the period 1980 to 1995. In Egypt, more than 10 percent of the nation's most productive farmland has been converted to urban use during the last 30 years, largely through illegal squatting or subdivision (Hardoy and Satterthwaite 1989). Between 1940 and 1990, Mexico City's area grew almost tenfold (Harris and Puente 1990). In terms of land area, cities such as Bangkok, Jakarta, and Mexico City are converting between 2,000 and almost 5,000 hectares of agricultural land each year (*see* Table 1). This conversion process, however, is not necessarily a negative trend; it generally reflects the lower value of agricultural land relative to urban land.

**Table 1. Annual agricultural land conversion in selected cities**

City	Hectares	Period
Ahmadabad	565	1980
Bangalore	1,311	1983-2001
Karachi	2,400	1971-1985
Bogota	2,325	1981
Mexico City	4,826	1970

*Source:* Dowall (1991a)

1.7 Within existing built-up areas of cities, a different type of land conversion is taking place. As cities expand, the value of land in centralized locations rises due to its proximity to employment and access to urban services. In response to this increase in land values, the density of development in central locations tends to increase to achieve more economical use of the land. In many countries, governments encourage this process by planning for and permitting higher density development as well as providing appropriate levels of infrastructure and services.

1.8 Although the urbanization process generally improves economic performance for a country, the often accompanying increases in urban land prices have negative implications for the urban poor. As demand for limited supplies of urban land increases, low-income populations are priced out of the legal land market. In many cases, these groups are forced to locate on unserviced illegal subdivisions in undesirable locations, often on the periphery of cities, where environmental

illegal subdivisions in undesirable locations, often on the periphery of cities, where environmental conditions are extremely poor. Compared to other urbanized lands, these areas also tend to be the most vulnerable to natural and man-made hazards.

1.9 The urbanization process also has resulted in land conversions that have negative consequences for sensitive environmental resources. For example, the dredging and filling of wetlands to support urban development can threaten biodiversity, and in some cases, destroy an important component of an area's natural flood or pollution control system. Within existing built-up areas of cities, important historic properties or open space may be compromised. The properties may be destroyed as part of government or private efforts to redevelop central areas of cities (where the housing stock and infrastructure have deteriorated) for more productive uses such as modern high-rise residential buildings or commercial centers. Alternatively, some historic districts may be left to deteriorate while their function as city center is moved to newly developed areas of the city. Unplanned and uncontrolled urban growth associated with urban sprawl also may result in negative environmental effects.

1.10 The remainder of this paper discusses in more detail the environmental problems associated with urban land use, the factors that perpetuate these conditions in Third World cities, and promising land management approaches to address these problems. It should be noted, however, that the paper covers only those issues that can be addressed through improved land management. It is not intended to deal with the other threats to urban land resources that are more appropriately addressed through alternative management approaches, for example:

- the main strategy for controlling land subsidence lies in water resources management and water pricing;
- deforestation associated with urban demand for wood fuels is addressed primarily through fuel pricing, demand management, inter-fuel substitution, and improved natural resource management;
- the solution to the contamination of land by solid and hazardous wastes as well as the deterioration of cultural resources by air pollution and poor drainage lies mainly in effective waste management and pollution control programs at various levels of government; and
- the impact of urban transportation on land use is addressed largely through transport planning.

1.11 Lastly, this paper is not intended to fully explore the urban land crisis and the various policies and instruments for improving the functioning of urban land markets. Many of these issues are addressed in other papers prepared under the Urban Management Program (*see* Annex B).

## II. ENVIRONMENTAL ISSUES IN URBAN LAND MANAGEMENT

2.1 As mentioned earlier, there are pressing environmental risks associated with poorly managed urban land—land degradation; occupation of land vulnerable to both natural and man-made hazards; loss of cultural resources and open space; loss of prime agricultural land; and excessive urban sprawl. Although the nature and extent of these risks in specific cities differ according to the unique land, environmental, economic, political, and socio-cultural conditions in each locality and may be viewed differently according to the concerns of individual constituencies (i.e., developers, environmental interest groups, or government agencies), the purpose of this chapter is to summarize the nature and extent of the land and cultural resource problems confronting most developing country cities today.

### **Land Degradation**

2.2 As urbanization occurs, land development exerts pressure on surrounding ecosystems. The negative impacts of such development may include the loss or destruction of wetlands and wildlands (together with their rich genetic diversity) and degradation of coastal zones. Urban development also can have negative impacts on downstream watersheds through increased runoff and erosion. The following highlights the nature and extent of impacts associated with the destruction of wetlands and/or the degradation of coastal zones.

### *Destruction of wetlands*

2.3 The destruction of ecologically or economically important wetlands<sup>1</sup> is a potentially negative effect of urban development. Accounting for about six percent of the global land area, wetlands are the transitional areas between terrestrial and aquatic environments and are one of the world's most productive natural ecosystems. They are valued for their ecological importance, intrinsic qualities, and potential future use.

2.4 In terms of their ecological importance, wetland services include flood protection; ground-water recharge; pollution control; wildlife habitat; food-chain support; and shoreline stabilization. In addition, some wetland scientists believe that large wetlands help to maintain low air temperatures in the summer and prevent extremely low temperatures in the winter. Wetlands also are valued for their intrinsic qualities; there are some who want to protect wetlands out of a desire to preserve, intact and unspoiled, unique natural ecosystems for future generations. Others value the abundant flora and fauna that may be found in wetlands as well as the opportunities they provide for recreational and educational activities. The third category of wetland values relate to their potential future use. For example, a gene pool associated with certain wetland flora and fauna may lead to future discoveries of new medicines.

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1. The Convention on Wetlands of International Importance defines wetlands as "areas of marshes, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water the depth of which at low-tide does not exceed six meters" (Turner, no date). The different types of wetlands include marshes (inland freshwater and saltwater, coastal salt, and tidal freshwater); swamps (shrub, wooded, and mangrove); bogs; tundra (wet arctic grassland); and bottom lands and other riparian habitats.

2.5 As shown in Table 2, wetland benefits can be categorized into three basic outputs: intermediate goods and services, final goods and services, and future goods and services. The extent to which a wetland can produce these outputs will vary from one wetland to another and from one region of a country to another. Moreover, some wetlands provide benefits that are primarily local or regional in nature; others may have national or even international significance. The value of each wetland, therefore, must be determined on an individual basis (Office of Technology Assessment 1984).

2.6 Notwithstanding their actual or potential benefits, wetlands are among the most threatened of environmental resources. Although many wetlands are lost as a result of direct conversion to intensive agriculture or aquaculture, a substantial number are being drained and filled for urban residential and industrial use. In developing countries, wetlands have been undergoing rapid conversion during the past 30 years (Ledec and Goodland 1989). In Sri Lanka, for example, low-lying lands and marshes in the Colombo Urban Area (CUA) are being threatened by urban and industrial development as well as domestic and industrial pollution. In Jakarta, a large portion of the kampung population occupies extensive coastal swamp land (Boross 1983). Similarly, about 4,000 hectares of lagoons and wetlands near the eastern fringe of Salt Lake City in Calcutta were filled to provide housing for 100,000 middle-income families (CSE 1989). Virtually all of the mangroves in Singapore and Hong Kong have been reclaimed for urban development (Hamilton and Snedaker 1984). When development occurs in wetlands, there can be a range of effects:

- In Sri Lanka, the draining of wetlands during the past 15 years for urban development is posing serious drainage problems in parts of the CUA, particularly Colombo City during and after heavy rains (World Bank MEIP 1990).
- In Salt Lake City (Calcutta), the filling of the wetlands (fish ponds) has upset the normal drainage cycle of the city because the wetlands were used to absorb excess rainwater. Because this land is higher than that of the rest of the city, there is flooding in the eastern fringe areas. In addition, development has threatened the use of the wetlands for sewage treatment and fish production (Sarkar 1990).<sup>2</sup>
- In Lagos and Manila, filling swamps for construction has resulted in blocking waters of extensive river systems. Consequently, large urbanized areas in both cities are now periodically flooded (Kreimer, Munasinghe, Preece 1992).
- In Singapore, filling mangrove swamps and other coastal reclamation activities has led to the near-disappearance of coastal prawn ponds and fish traps that once provided abundant harvests (Chia 1979).
- In the Mediterranean region, the draining of wetlands for land reclamation and malaria prevention has reduced wildlife habitat; diminished the wetlands' buffering effect in capturing pollutants, sediment, and floods; and contributed to a decline in fisheries (World Bank and EIB 1990).

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2. These were actually "engineered" wetlands. The original wetlands were converted many years ago to productive managed fish ponds.

2.7 Contamination by urban wastes and pollution poses another important threat to wetlands. In Angola, for example, Lobito's wetlands are heavily polluted because they are used for dumping wastes and receive urban and stormwater runoff mixed with sewage. This pollution of wetlands affects species diversity and therefore their ability to support and replenish stocks of coastal fisheries, which in turn affects economic returns from ongoing and potential activities such as fisheries, fishing and fish-related industries, and tourism. It also threatens the nutrition and health of the poorest sections of the Lobito-Benguela Conurbation's population, which is heavily dependent on fish protein.

2.8 Advances in wetland science have greatly increased our understanding of the ways in which wetlands contribute to human welfare. By observing biological and physical characteristics of wetland systems, it generally is possible to identify the presence or absence of wetland functions and associated goods and services. Nonetheless, the ability to quantify the relationships between wetland characteristics and functions is limited. Moreover, even when there are data on the functions of a specific wetland system, it is not possible to measure the quality and quantity of goods and services that it produces. Nonetheless, these linkages must be estimated before economic methodologies can be used to estimate how development of those wetlands might change human welfare (Scodari 1990).

### *Degradation of coastal zones*

2.9 Coastal zones<sup>3</sup> are under enormous development pressure from the concentration of urban centers and associated activities such as tourism, commercial and industrial development, and port development. Although these activities can generate economic development in terms of increased tourism revenues and employment opportunities, poorly managed coastal development can threaten critical habitats, disrupt ecosystem processes, and destroy the coast's natural defenses against severe winds and high water generated by hurricanes and cyclones. For example, uncontrolled development of housing or industrial facilities can destroy barrier islands, coral reefs, dunes, mangroves, estuaries, tidal marshes, and coastal lowlands—all of which can reduce the destructive forces of wind and water (for example, mangroves hold sediment in place and act as a frictional barrier, sand bars and dunes can exchange sand during strong winds, coral reefs act as a seawall). The most severe beach erosion occurs in areas where buildings and roads are placed too close to the water's edge and are being threatened by storm-induced erosion. In such cases, the beach often is "armored"—seawalls or groins are built to protect threatened properties or jetties are erected to keep inlets open. These structures, however, are costly to construct and may even worsen the general erosion problem (Clark 1991).

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3. The term "coastal zone" is commonly referred to as the interface or transition space between the land and sea (Sorenson and McCreary 1990). It is the area where processes depending on land and sea interactions are most intense. Coastal landforms have significant ecological and economic importance. They provide natural resistance to potentially damaging waves, flooding, and erosion from hurricanes and storms and provide habitats for fishes and aquatic life, coral reefs, and mangrove forests. The delineation of the coastal area varies by country. At one extreme, the coastal zone could extend from the oceanward edge of the exclusive economic zone (that is, an area to which the Convention on the Law of the Sea authorizes a coastal nation to have exclusive use in order to exploit the resources of its coasts), usually 200 nautical miles, to the inland limit of climatic influence which could measure at least 250 nautical miles wide. At the other extreme is a boundary designation that extends from the mean low tide to an inland distance of 200 meters.

**Table 2. Wetland outputs**

- 
- I. Intermediate Goods and Services (serve as factors of production for other goods)
    - A. Commercial Factors (serve as factors of production for market goods)
      - Support of commercial fisheries
      - Provision of commercially harvested natural resources (for example, timber, peat, small fur-bearing mammals)
      - Water supply and storage
      - Assimilation of wastes (for example, for tertiary treatment of human wastes)
    - B. Damage Prevention Factors (serve as factors of production for a wide variety of goods and services)
      - Pollution assimilation/water purification
      - Flood control
      - Erosion Prevention
  
  - II. Final Goods and Services (produce consumer satisfaction directly)
    - A. Recreational Opportunities
      - Consumptive uses (for example, fishing and hunting)
      - Non-consumptive uses (for example, camping, hiking, boating, birdwatching)
    - B. Amenities
      - Scenic value
      - Spiritual value
      - Education
  
  - III. Future Goods and Services (may fall into any of the categories above)
    - A. Undiscovered goods
    - B. Future high-value development

*Source:* Scodari (1990)

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2.10 Unplanned growth and influxes of tourists also impose excessive demands on infrastructure and services which place a major financial burden on local communities. In addition, there may be adverse impacts such as pollution of coastal waters, that threatens fisheries and biodiversity, and degradation of natural areas and scenic vistas. In the Southwest Coast area of Turkey, for example, the development of new tourist accommodations and explosive growth in the construction of vacation residences and second homes overburdens water, sewerage, and other services. The siting of second homes outside municipal boundaries, caused partly by the high cost of urban land and lax enforcement of development regulations, also makes it more costly to service these dwellings and degrades the aesthetic quality of the area (Marzin et al. 1991).

2.11 In addition to these effects of urbanization on coastal resources, the degradation of coastal resources can impose negative impacts on tourism. In Tetouan, Morocco, for example, construction, excavation on coastal dunes and beaches, and pollution poses severe and immediate threats to sensitive coastal resources. If development continues as projected, both the ecological integrity and value of those resources to tourism can be expected to decline dramatically within a decade (U.S. AID no date).

### **Occupation of Hazard-prone Lands**

2.12 In many developing countries, low-income populations occupy squatter communities or illegal subdivisions located on land vulnerable to such hazards as severe or frequent tropical

storms, floods, earthquakes, volcanic eruptions, wildfires, and chemical accidents. When these events occur in or near densely populated areas, they may constitute major environmental disasters. Managing land so as to limit the occupation of such hazardous areas by the urban poor requires consideration of the nature and potential impacts of both natural and man-made hazards.

### *Natural hazards*

2.13 As cities grow, increasing numbers of low-income populations are forced to occupy land vulnerable to natural hazards (*see* Table 3). Examples of hazard-prone settlements include those that develop on land subject to flooding or tidal inundation (i.e., Accra, Bombay, Delhi, Bangkok, Guayaquil, Recife, Monrovia, Cotonou, Lagos); steep hillsides vulnerable to landslides and rock falls (i.e., La Paz, Rio de Janeiro, Caracas, Port Moresby, Guatemala City, Hong Kong, Medellin, Caracas); and areas under considerable seismic risk (i.e., Mexico City, Guadalajara, Oaxaca).

**Table 3. Potential natural hazards**

Atmospheric	Hydrologic
Hailstorms	Coastal Flooding
Hurricanes	Desertification
Lightning	Salinization
Tornadoes	Drought
Tropical Storms	Erosion and sedimentation
	River flooding
	Storm surges
Seismic	Volcanic
Fault rupture	Tephra (ash, cinders, lapilli)
Ground shaking	Gases
Lateral spreading	Lava flows
Liquefaction	Mudflows
Tsunamis	Projectiles and lateral blasts
Seiches	Pyroclastic flows
Other geologic/hydrologic	Wildfire
Debris avalanches	Brush
Expansive soils	Forest
Landslides	Grass
Rock falls	Savannah
Submarine slides	
Subsidence	

*Source: Organization of American States (1990)*

2.14 Poor groups who occupy hazardous areas are not unaware of the potential danger of the areas they inhabit. Normally these groups choose hazard-prone lands because they are less likely to be forcefully evicted by the landowner. The worse the environmental conditions, the more likely the landowner will allow them to stay. In most countries, the fact that these settlements are illegal also means that municipal authorities do not feel obligated to provide them with water, sanitation, drainage, and public health care. In Mexico City, for example, approximately 1.5 million people live on the drain bed of Texcoco, the part of the valley of Mexico plagued by constant floods, dust storms in dry season, and an almost complete lack of urban services. Although housing development in this

**Box 1. Hillside settlement site in Mozambique**

Triangulo is an informal settlement located on steep slopes above the port city of Nacala in Mozambique. The sandy soils from the hillside are exposed and waste down into the city when it rains. Following a landslide in 1982, as much as two meters of sandy soil covered the highway and railway below Triangulo, and there was considerable loss of property and life.

According to the master plan, settlement on the steepest part of the slope is illegal. Improvements to existing houses and new construction are not permitted. The area is defined as a critical zone and the master plan calls for evacuation of the area and resettlement of the residents. Nonetheless, a survey showed that nearly one-third of the dwellings in the illegal zone had been constructed since the 1982 disaster, indicating that people will continue to settle on the steep slopes—however dangerous—because of the easy access the site offers to jobs in the city below.

*Source:* Finnish International Development Agency (1989), cited in Cooperative Housing Foundation (1992)

area is illegal, the “colonias populares” were built because more suitable sites were not within the economic reach of low-income groups (Hardoy and Satterthwaite 1992). In some countries, the urban poor occupy marginal lands near the inner city to have access to central area employment opportunities, even when free or cheap land is available on the urban fringe (see Box 1). The cost of commuting to the central city from safe land on the urban periphery may be prohibitive.

2.15 In many instances, the location of low-income populations on lands having inadequate infrastructure to mitigate the effects of natural hazards has resulted in substantial losses of lives, injuries, and massive property destruction. In Rio de Janeiro, for example, the planning authority estimates that three million people (nearly two-thirds of all favela dwellers) live on the steep slopes surrounding the city. Mudslides, which claim hundreds of lives and leave thousands homeless, have become commonplace during the annual rainy season after squatter settlements strip away vegetation and thus destabilize the hillside soils. In February 1988, flooding and landslides due to unusually heavy rains in the metropolitan region of Rio de Janeiro exacted a heavy toll (see Box 2). In metropolitan Buenos Aires, damage due to heavy flooding in 1985 was estimated at over US\$200 million (see Box 3).

2.16 After a disaster occurs, the adverse effects on employment, balance of trade, and foreign indebtedness can continue to be felt for years. The poorest countries and the poorest segments of their populations feel the most severe impact (OAS 1990). One study estimates that 95 percent of disaster-related deaths have occurred among the 66 percent of the world’s population that lives in the poorer countries. In Peru, for example, the average annual death toll from natural disasters is 2,900; in Japan, with similar natural hazard occurrence, the average annual death toll from natural disasters is 63 (Anderson 1990). Moreover, although natural events cause loss of property and life in every country, the loss of resources exact a higher burden on the poorer countries. Even though economic losses from disasters may be absolutely higher in the wealthier countries because there is more property of higher value to be damaged, the loss of GNP due to disasters is estimated to be about twenty times greater in developing countries than in developed countries. Poverty, therefore, increases the likelihood that any crisis will become a disaster (Anderson 1990).

2.17 In the urban areas of developing countries, poor planning, inappropriate building design, faulty construction, inadequate maintenance, and squatter settlements on hazard-prone lands all contribute to both environmental degradation and increased vulnerability to catastrophic events.

### Box 2. Flooding in Rio de Janeiro

In February 1988, unusually heavy rains fell in the metropolitan region of Rio de Janeiro, Brazil's second largest city. In some areas, the equivalent of three months annual rainfall fell in less than 24 hours. By March 10, the resulting floods and landslides had left about 289 people dead, 734 injured, and 18,560 homeless and had caused extensive damage to physical infrastructure (that is, roads, bridges, canals, drainage networks, dikes, water and sewerage networks, electric power, factories, and commercial establishments). The floods and landslides cost an estimated US\$935 million; US\$400 million in direct costs for physical damage and US\$535 million in indirect costs (US\$435 million in lost production, US\$50 million in lost revenues from tourism, and US\$50 million for the cleanup operation immediately after the disaster.) The physical losses severely disrupted Rio's economic activity, particularly in the northern part of the metropolitan region, and left the predominantly low-income population with limited access to schools, health facilities, and basic sanitation.

The severity of the floods can be attributed largely to the region's vulnerability to natural hazards. Nonetheless, environmental degradation resulting from unplanned expansion of human settlement, faulty construction, congested drainage, and inadequate maintenance contributed heavily to the event's catastrophic outcome. Poverty was also linked both to the causes and the consequences of the disaster. The poor of Rio, who live in such high-risk areas as steeply sloping hillsides, landfills, and floodplains, became both the perpetrators and the victims of environmental degradation.

Roughly one-sixth of the region's families live in poverty. On much of the city's periphery, especially in the favelas, the supply of services has been affected by flawed infrastructure planning and inadequate investment, combined with several years of neglect in management and poor or nonexistent maintenance of facilities. Drainage networks were severely blocked by silt and uncollected solid wastes. Uncollected garbage and inappropriate disposal of solid wastes, often piled above residential areas (about 5,400 tons a day in the metropolitan region), became raw material for the landslides of February 1988, burying homes and sweeping away hillside squatter settlements. To compound the problem, most municipal refuse goes to open dumps, which are often occupied by squatters who have no formal access to land. These landfills are hazardous sites for construction because the soil is unstable, making them susceptible to runoff and erosion. Uncontrolled wastewater ends up in nearby drains or streets, further degrading already unstable land.

*Source:* Munasinghe, Menezes, Preece (1991)

Overcrowding, congestion, poverty, unemployment, and inadequate infrastructure and services further weaken urban resistance to natural hazards. For example, accumulated garbage and human waste often turn a flooded area into an open, overflowing sewer. Extensive development on high-risk sites, combined with deforestation and the dumping of solid wastes in rivers and canals, increases susceptibility to the landslides that often follow floods (Kreimer and Munasinghe 1991). A deteriorated environment is more vulnerable to hazardous weather events which, in turn, further degrades the environment with each new occurrence.

2.18 In many densely populated nations, population growth and urban development are increasing the risk of natural disasters to inhabitants of coastal lowlands. Coastal inhabitants become more susceptible to natural hazards such as floods, typhoons, or tsunamis when land reclamation projects encourage settlement in dangerously low-lying areas, or when land clearing and construction remove protective vegetation, reefs, or sand dunes. In Bangladesh, for example, more than 300,000 people were lost in major sea storms and floods in the recent past (Clark 1991). In April, 1991, a giant wave caused by a cyclone swept over densely populated, low-lying islands in Bangladesh, killing 100,000, leaving thousands missing, and wiping out electric power. Communication with the outside world was out for weeks (*Urban Edge* 1991). The worst economic effect of Hurricane Gilbert in Yucatan, Mexico, in 1988 was the loss in tourism revenues in areas such as

**Box 3: Flood damage in Buenos Aires**

On May 31 and June 1, 1985, 308 millimeters of water fell on Buenos Aires. The subsequent flood made it necessary to evacuate 100,000 people, damaged 2,500 dwellings, and 14,000 motor vehicles, and left 100,000 dwellings without electricity, telephone service, and running water. Public and private firms suffered millions of dollars in losses. The number of victims was tragic. The economic costs of this flood are presented below.

Item	Cost (US\$000)
Damage to telephone services	2,675
Damage to electric power supply	4,500
Civil defense expenses	1,275
Damage to dwellings	165,000
Costs related to lost work days	24,300
Vehicular damage	1,050
Damage to municipalities	625
Decrease in value added	4,375
Loss of income (transport)	20,400
Damage to movable goods	9,375
Public health expenditures	12,500
	246,075

The low-lying areas in the Belgrano, Nunez, Palermo, and Villa Crespo districts, areas in the vicinity of the Riachuelo and lower Flores Rivers, and sites at Lugano became real traps. In these areas, the drainage projects completed in 1939 had been allowed to exceed their safety margins with no new works carried out—in spite of the rapid urban growth that had taken place. Although this has made Buenos Aires a highly vulnerable city, all strata of the population are not equally vulnerable. For example, temporary or self-help dwellings are more vulnerable to flooding than dwellings built of solid material. In view of the fact that much of the flood damage is found in the parts of the city where poverty predominates, it is clear that this problem of vulnerability is more directly linked to socioeconomic and political factors than to geography.

*Source:* L.A. Costa and D. N Albini, in ECLAC (1991)

Cancun and Cozumel. Almost all tourist reservations at Cancun were canceled and it took two to twenty months to rebuild the hotels and resorts. In addition, the power and telephone systems were heavily damaged (Clark 1990).

2.19 Earthquakes are also responsible for extensive damage in developing country cities. In Mexico City, for example, the September 1985 earthquakes inflicted the worst level of damage to low-income families living in overcrowded poorly built tenements. The earthquake killed more than 5,000 people, caused 16,000 injuries, and damaged or destroyed 12,700 buildings, 65 percent of which were residential. The dwellings of about 180,000 families were damaged and 50,000 people had to be temporarily relocated. Also affected were 340 office buildings, in which 145,000 government workers were employed; 1,200 small industrial workshops; 1,700 hotel rooms; 1,200 schools; and 2,000 hospital beds. The loss exceeded US\$4 billion (Kreimer and Echeverria 1991). In 1986, earthquake damage in the capital of El Salvador exceeded US\$1 billion—about one quarter of the country's GNP (ECLAC 1991).

2.20 Although earthquakes are naturally occurring, the damage they cause is largely a function of development decisions. The expansion of slums and squatter settlements to the most vulnerable areas of the city has increased the cost and magnitude of earthquake disasters. Substantial

#### Box 4. Earthquake damage in Dubrovnik

On April 15, 1979, a catastrophic earthquake struck the area of the Socialist Republic of Montenegro with an intensity of 9–10 grades on the Mercalli scale. Although few buildings were completely destroyed by this tremor, the shored-up walls and plastered-over cracks concealed a latent threat. The town was left in a fragile state and would be extremely vulnerable to any new earthquake, even one of much lesser intensity. On May 24, 1979, another tremor of 6 MCS shook Dubrovnik, resulting in large-scale destruction.

The extent of destruction and damage on specific areas depended on the intensity of the shock in individual places and on the basic materials from which the structures had been constructed. The area receiving the most damage was the old city center, the site of the largest number of historic monuments (residential buildings, local government facilities, schools, health institutions, cultural centers, shops, hotels, restaurants) of the highest concern to the world cultural community.

According to the initial assessment of damage carried out in accordance with an instruction prescribing uniform methods for the estimation of damage from natural disasters (Sluzbeni list SFRJ, No. 17/79), and on the basis of an agreement on the assessment of damage from natural disasters (Sluzbeni list SFRJ, No. 4/78), the total damage reported and verified was US\$379,350,960 (adopted in September 1983); of this amount, US\$297,633,080 applied to cultural monuments (including residential buildings).

Assessing the damage to historic buildings became a sensitive issue because the usual criteria applied to other structures was non-applicable. It was not possible to determine the value of such cultural monuments by deducting depreciation—the value of such monuments increases with age. Damage caused to historic buildings was determined by an analysis based on their category. Cultural monuments, including historic buildings, are classified from 0–5. The highest category is 0; the preservation of monuments in this category is the concern of the international cultural community. Category 1 includes monuments classified as of Yugoslav significance. Category 2 monuments are of republican or national significance, and categories 3, 4, and 5 are of regional and local significance. In Dubrovnik, 89 percent of the total area of structures damaged were in the 0 and 1 categories. Consequently, the Municipality of Dubrovnik ordered a new study of the extent of damage. This second damage assessment submitted in 1980 totaled US\$553,551,180 with US\$436,437,380 damage attributed to cultural monuments. This second assessment, however, was not formally adopted.

*Source: Letunic (1990)*

losses are largely due to inadequate design, poor building techniques, poorly supervised construction, and the effects of poor housing and infrastructure maintenance (Kreimer and Munasinghe 1991). In Mexico, for example, expanding urbanization has drawn an increasingly larger number of inhabitants into areas under considerable seismic risk. According to Jakob (1989), it is estimated that as many as 50 percent of the urban population live in areas of significant seismic risk. Further, a substantial portion of Mexico's industrial capacity, virtually all federal government institutions, and almost all of its tourist areas are situated in areas of high risk to earthquakes and hurricanes.

2.21 In Eastern Europe as well, poor location and weak design and building techniques have been significant factors contributing to vulnerability to earthquakes. In Spitak and Leninakan (Armenia), located about 50 kilometers from the epicenter of the 1988 earthquake, tall buildings of about nine stories built with prefabricated concrete had a high rate of collapse (Kreimer et al. 1992). In some cases, certain industries have located installations in earthquake prone areas. For example, tourist facilities were constructed along a fault that crossed the Municipality of Dubrovnik. The earthquake of 1979 subsequently damaged many hotels and restaurants and caused massive destruction to urban infrastructure, including the road network and water and electric power systems. The extensive damage to historic properties totaled more than US\$379 million and tourism came to a standstill (*see* Box 4).

### Box 5: Urban vulnerability in Katowice

The city of Katowice is located in a metropolitan area called the Upper Silesian Industrial Region (USIR) which lies within the Katowice Voivodeship (governorate). The city of Katowice, which in 1990 had a population of 373,000, is the industrial center of the USIR and the capital of the Voivodeship. The city's economy is based on mining, heavy industry, construction, and services. Within Katowice's municipal borders, there are over 90 large industrial plants, 6 coal mines, 2 metallurgical plants, 2 non-ferrous metal factories, 13 electro-mechanical plants, and 2,980 other factories producing such goods as pottery, processed food, chemicals, and various typographic, optical, and electronic equipment.

Although there is relatively little poverty in the Katowice Voivodeship (due to the egalitarian wage and welfare policies of the previous communist government), the general population of the city of Katowice and the USIR are subjected to significant health risks associated with inadequate waste management practices and the government's failure to separate residential from industrial activities. Typically, the centers of cities are dominated by heavy industries and coal mines, surrounded by dwellings and unsanitary waste sites. Inhabitants of Katowice are in direct contact with pollutants at home and at the workplace and suffer high rates of morbidity and mortality from these agents as a result.

According to Hertzmann (1990), urban life expectancy for men and women in the Katowice Voivodeship is the shortest in Poland: more than a full year lower than the national average. This increased urban mortality is a function of higher rates of cardiovascular diseases, cancers, and digestive tract illnesses in males and females over 60 years of age. This is consistent with high levels of exposure to cancer-causing agents and air pollutants that affect the cardio-respiratory system, as well as the heavy contamination of the food supply with industrial effluent.

Children have been most vulnerable to the environmental conditions in the area. In Katowice City, the 1989 infant mortality rate was 25.5 per 1000 live births (as compare with the national average of 16.1 per 1000). The results of a six-year study during the 1980s in sub-regions of the Voivodeship concludes that infant mortality is correlated with dust fall, ambient levels of lead, tar, phenols, formaldehyde, and benzo(a)pyrene. The Voivodeship also suffers from the highest incidence of premature births (8.5 percent), genetic defects (10.1 percent of all live births), and spontaneous miscarriages. More than 60 percent of children exposed to pollutants from non-ferrous smelting plants have body weights and heights lower than the 50th percentile. Chronic bronchitis is reported in 35 percent of children living in heavily polluted areas, compared to only 4 percent in less polluted areas.

*Source:* Borkiewicz et al. (1991)

### ***Man-made hazards***

2.22 Man-made hazards pose additional threats to the urban poor, who often locate on vacant land in close proximity to polluting industries, waste disposal sites, or other hazardous installations. In Manila, for example, about 20,000 people occupy land surrounding an open solid waste dump known as Smokey Mountain, where decomposing organic wastes produce a permanent haze and powerful stench throughout the entire area. Some of the occupants have lived near this dump for more than 40 years. Moving to a safer, more sanitary location is beyond their means and many earn a living from the dump by scavenging (Hardoy and Satterthwaite 1989). In Istanbul, Turkey, the occupation of a slum located below a city dump resulted in tragedy when an avalanche of garbage triggered by a methane gas explosion killed close to 30 people. The death toll was expected to rise above 50 (*Mexico Times-Herald* 1993). On a larger scale, high rates of cancer and other health effects in Katowice, Poland illustrate another example of urban vulnerability associated with poor land management (*see* Box 5).

2.23 The urban poor who live near industrial facilities are the most vulnerable to the deaths, injuries, and property damage resulting from industrial accidents. Three events which occurred in

### Box 6. Industrial accident at Bhopal

In December 1984, the sudden release of 30 tons of methyl isocyanate by a pesticide factory belonging to Union Carbide at Bhopal in India caused the death of nearly 3,000 people living in the vicinity and affected more than 300,000 others who were exposed to the deadly poison. Long after the tragedy, victims continued to suffer from such conditions as breathing difficulties, dry cough, chest pain, restrictive lung diseases, dry eyes, and photophobia. The most serious and permanent damage among the injured was in the respiratory tract. Many survivors could not be employed because they suffered from bronchitis, pneumonia, asthma, and fibrosis.

The tragedy of Bhopal illustrates how a rapidly developing city sought and obtained sophisticated industry without making commensurate investments in industrial safety and pollution control, and without establishing effective urbanization policies. Bhopal's rapidly rising population, coupled with high land and construction costs, caused a severe housing shortage in the city. Consequently, many of the migrants became squatters, illegally occupying land and creating slums and shantytowns. Most of these settlements cropped up around industrial plants and other employment centers; slum dwellers served as a pool of cheap labor for industry, construction, offices, and households seeking domestic help. By 1984, Bhopal had 156 of these slum communities providing homes for nearly 20 percent of the city's population. Two of the colonies, Jaya Prakash Nagar and Kenchi Chola, were located across the street from the Union Carbide plant—even though the area was not zoned for residential use.

The near-absence or lack of social infrastructure in these areas was accompanied by an inadequate industrial infrastructure. The government was reluctant to force industry to adopt industrial safety and pollution control measures because it feared losing employment opportunities. In addition to a variety of human, technical, and organizational factors, poor land use control magnified the effects of the gas leak on those residing near the plant.

*Source:* Shrivastava (1987)

1984 illustrate the severity of this problem: the leak of deadly gaseous chemicals in Bhopal, India (*see* Box 6); the explosion of a petroleum storage facility in Mexico City; and the incineration of a natural gas pipeline in Cubatao, Brazil. In 1992, slum dwellers in Bangkok were the victims of an explosion of toxic chemicals stored in Klong Toey port (*see* Box 7). Although the causes of these disasters were diverse, virtually all of the victims were extremely poor people who occupied previously vacant lands adjacent to major industrial facilities in heavily urbanized areas. While the cumulative environmental destruction and the total number of victims from these disasters are difficult to assess, the evidence suggests that they were substantial. In all cases, however, the death and injury toll probably would have been substantially lower if the squatter settlements had not been located so close to the industrial facilities (Leonard 1986).

### Loss of Cultural Resources and Open Space

2.24 An often overlooked issue in urban environmental management is the degradation of cultural resources and loss of open space. Although the nature of these resources will differ according to conditions in individual developing country cities, both the cultural resources and open space in a city or urban area serve a variety of public purposes and are important constituents of a city's environment.

#### *Cultural resources*

2.25 The deterioration or loss of cultural resources<sup>4</sup> is due in large part to uncontrolled urban growth, as well as poorly planned construction of urban infrastructure; inadequate water supply,

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4. The UNESCO 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage defines "cultural property" as monuments, groups of buildings, or sites that are of universal historical, aesthetic, ethnological, or anthropological value.

**Box 7. Hazardous chemicals threaten slum dwellers in Bangkok**

On March 2, 1991, five people died and over 3,000 were made homeless by fires from a massive chemical explosion in Bangkok's Klong Toey port. As a result of the explosion, large sacks of phosphorus caught fire, 200-liter tanks of liquid alcohol exploded, and three tanks of chemical gas exploded. According to newspaper accounts, three out of five warehouses owned by the Port Authority of Thailand that stored hydrogen peroxide, aluminum powder, iron oxide, methyl bromine, ammonia argon acetylene, phosphorus, polyurethane, DDT, and other chemicals (about 30 altogether), were destroyed. The explosions spewed fireballs to nearby slum areas and created an "eerie black cloud" that was visible for 20 miles. Damage to goods and warehouses was said to be at least 40 million baht (US\$1.5 million).

Many of the victims, taken to hospitals for testing, had blood levels of methyl bromide above an acceptable safe level. Some victims reported strong physical reactions to the subsequent rainfall, such as "burning pain on the skin, congested breathing, and a sore throat." It is feared that some of the unborn children whose mothers inhaled the toxic fumes and/or were exposed to the contaminated rainfall will have deformities, as occurred in a similar incident in 1989. Victims of the accident were urged to sue the Port Authority of Thailand, but none were willing for fear of eviction from the slum; the land is owned by the Port Authority.

The chemical waste left over from the fire was eventually buried in Kanchanaburi Province, and according to local residents, it has seeped into waterways to cause foul odors and skin ailments. Although posters and banners of protest appeared in front of affected homes and shops, there remains a sensitive situation involving property rights. The army, which was charged with burying the wastes, has been trying to evict the "trespassers" in the area since it was declared the property of the Ninth Infantry Regiment in 1978. Villagers without proper documents are trying to prove that they have been on this land for generations.

*Source:* Shin et al. (1991)

sanitation, and drainage facilities; and failure to properly maintain both buildings and infrastructure. Examples of these conditions are found in cities throughout the developing world.

2.26 In Mediterranean cities such as Tunis, Istanbul, and Cairo, many important historic buildings are being permanently damaged or indiscriminately razed as a result of uncontrolled urban growth. In Izmir, Turkey as well, numerous historic residential, commercial, and industrial structures from the 18th and 19th centuries are under serious development pressure. Due to the high value of land, historically important houses have been demolished and their sites redeveloped for medium-rise commercial and residential structures (World Bank 1989). In some cases, total destruction of important cultural resources results in losses of related tourism revenue and employment opportunities.

2.27 As a result of inadequate infrastructure as well as poor building and infrastructure maintenance, historic properties are rapidly deteriorating. In many cities, for example, substantial portions of low-income populations live in older buildings in centrally located historic areas that once housed relatively well-off households. After these wealthier households moved to the suburbs, inner-city housing stock was subdivided so that several households could live in houses or apartments previously occupied by only one family. These dwellings, however, are rarely served by piped water and adequate waste removal provisions, and therefore deteriorate at alarming rates.

2.28 In Latin America, all historic centers of cities and metropolitan areas have suffered changes in land use, growing physical decay, and deterioration in services during the past few decades. In cities such as Bahia, Salvador, Panama City, and to some extent, Lima and Quito, the

historic centers have lost the functions which were traditionally concentrated in the central districts of their respective metropolitan areas, although they may preserve some government, banking, educational, and commercial functions. The movement of the traditional uses of central districts to other areas of the city or to new administrative, university, and commercial centers and residential neighborhoods has highlighted the economic marginality of the historic centers and physical decay.

2.29 One of the most visible and serious impacts of poor infrastructure on cultural property is the extent to which dampness is rising to unprecedented levels in historic buildings. With increasing urbanization and population growth, water has been made available to more people in much greater quantities than ever before, but the facilities for draining that water out of the city usually are nonexistent or inadequate. For example, Shibam, Yemen, has some of the highest mud buildings in the world, but inadequate drainage systems have brought increasing amounts of sewage and waste water straight into the ground around them. The contamination of this water by sewage and other pollutants has produced structural problems as evidenced in the large cracks that have appeared on the buildings (Lewcock 1986). In Cairo, many historically important churches and mosques built below the present street level are rapidly deteriorating from a sewage backup which leaves many standing in water (Kamil 1992).

2.30 Air pollution from industrial and mobile sources presents another threat to cultural resources. In India, for example, high levels of air pollution in Agra are damaging the Taj Majal. Air pollution is also corroding historic buildings in Zagreb, a small medieval city in Hungary, as well as in other East European cities such as Prague and Budapest. In Poland, emissions from steel and chemical plants are destroying Krakow's old town square. In Rio de Janeiro, damage to the historic Igreja Nossa Senhora do Carmo church is attributed to high levels of automobile emissions coming from a major traffic thoroughfare approximately two meters away (Smith and Magee 1990). In Cairo as well, air pollution from the exhausts of large trucks in the medieval city settles on the facades of historic buildings (Kamil 1992).

2.31 Although the conservation of cultural resources in Third World cities may not be viewed as a priority issue in light of other pressing environmental problems, the destruction of cultural property is generally irreversible. When historic sites are degraded or destroyed, their value and the information they contain are lost forever. Cultural properties are products of high levels of sophistication, knowledge, tradition, and history, that in many instances have taken hundreds or thousands of years to develop. Although some economists contend that reversibility is possible given sufficient application of technology and money, others maintain that once destroyed, cultural property cannot be replaced (Taboroff 1990). For many, the destruction of cultural resources represents a loss of national identity, ethnic pride, or spiritual values. In some cases, local land use decisions threaten the integrity of internationally significant cultural resources.

### *Open space*

2.32 In many countries, urban encroachment has compromised natural landscapes and other open spaces<sup>5</sup> in or adjacent to cities. In cities such as Athens, Istanbul, Izmir, Tunis, and Alexandria, for example, the increasing density of buildings and the destruction of houses with courtyards are

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5. Open space can be defined as non-built public or private green areas, which includes parks, squares, gardens, pathways, and individual greenery elements (lawns, trees, shrubs). Although some of these spaces may have no specific or official

compromising many open gardens (Taboroff 1990). In Accra, illegal encroachment on several open areas earmarked for recreational activities has taken place (Amuzu and Leitmann 1991). Although the need for recreation and scenic beauty may be less critical than for other urban purposes, such as land for housing the poor, the loss of space for these amenities prevents both present and future generations from enjoying their benefits. In Bangkok, the lack of adequate recreational area proportional to the size of population in the city is considered to be a significant aesthetic loss and one cause of the deterioration of urban quality of life (Unkulvasapaul 1992). The urban poor are affected the most; higher income groups usually live in areas that have more open space or can pay to obtain access to recreational areas (Hardoy and Satterthwaite 1991).

2.33 The conversion of open space for urban development has also increased water impermeable areas and therefore upset natural drainage systems and caused serious flooding problems, as in the case of Sao Paulo. When combined with ground-water overdraft, the loss of water permeable lands can also cause severe land subsidence problems. In Manila, for example, ground-water demand over the past 30 years has far exceeded natural recharge leading to problems of subsidence, which has been estimated to be some 36 millimeters in the south harbor of the city. Ground-water demand also affects the contamination of ground water through salt water intrusion (Munasinghe 1990). Once saline water begins to intrude, deterioration of water quality can persist for years, even after the initial cause is removed. As little as two percent saline intrusion can make an aquifer unusable. Even lower percentages can place the future use of an aquifer as a drinking water supply source seriously at risk (Parker 1992).

### **Loss of Prime Agricultural Land**

2.34 One of the unavoidable impacts of land conversion for urban development is the loss of prime agricultural land. Although there are few studies on land conversion in developing countries and subsequent effects on food security, low-income housing, and national economies, there is evidence that under certain conditions (for example, where arable land is scarce or where it results in over-intensive use of agricultural land), the conversion of prime agricultural land to urban use may have negative impacts. Not only does additional farmland have to be found elsewhere, but the food has to be carried greater distances or imported and stored for longer periods at higher energy costs (Douglas 1992). This will tend to increase food costs for consumers.

2.35 In the Zhejiang Province of the People's Republic of China, for example, vast areas of agricultural land on the fringes of cities are being converted to urban uses. In Hangzhou, total residential floorspace more than doubled between 1980 and 1986 as a result of the massive expansion of urban areas due to rural migration. According to Dowall and Clark (1991), this loss of productive farmland has become a problem in terms of food security. In Jakarta, an estimated 40,000 hectares of cropland is converted to urban use annually. Replacing the productive capacity of this land is

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use, many are valuable for a variety of reasons. They serve as national, state, local and private parks, preserves, and recreational areas; archaeological preserves; urban greenbelts, greenways, and trails; public access to shores and rivers; land for urban agriculture; and buffer zones to provide separation between conflicting land uses or to protect vulnerable areas. Open space lands also can preserve ecological resources (i.e., animal and plant habitats, wilderness areas, scientific reserves, threatened species and ecosystems); promote aesthetic values; and create community identity. In many cases, open space lands provide direct health and safety benefits when they serve as drainage channels or fire zones, help recharge aquifers, or in the case of forested lands, clean the air and moderate temperatures. The scenic beauty of some open lands also brings economic benefits when they attract tourists.

### Box 8. Agricultural land conversion in Dhaka

The city of Dhaka is bounded on the west and south by the flood plain of the Burhi Ganga River and on the east by the flood plain of the Balu River. Both areas are flooded (1.5–4 meters) up to four months of the year. Most of the land above the flood line and within a reasonable distance from the central core is either already in urban use or of high agricultural value. Resolving the conflicting demands for the scarce supply of land not subject to flooding is difficult. The municipal authorities are concerned with providing land and shelter for a population whose residential location options are severely limited by the inability to pay for public transport. At the same time, there is an urgent need to ensure an adequate food supply for Dhaka City's population, which grew at an average annual rate of eight percent during the period 1974–1981.

In recent years, however, the conversion of land around Dhaka City has been occurring at a rapid rate, because it is more profitable for small farmers in the area to sell their land and move to the city. This is mainly because market rents for housing have risen much faster than food prices; wages in agriculture are less than one quarter of the wages in other sectors. To compound the problem, there has been intensive land speculation in recent years by expatriate workers and high-income individuals. Due to the lack of alternative opportunities for investment and the fact that land is regarded as a secure hedge against inflation, roughly one third of the savings of expatriate workers have been used to purchase land.

*Source:* UNCHS (1986) and United Nations (1987)

estimated to cost US\$50-100 million per year (World Bank 1990). In addition to possible food security problems stemming from agricultural land conversion, there are also potentially serious environmental consequences associated with mixing urban and agricultural land uses. For example, both agriculture and industry are intensive water users. Where there are mixed land uses, the demand for water may exceed the capacity of the underlying aquifer and therefore result in land subsidence or ground-water contamination. Conversion of agricultural land to urban use also can increase the total amount of runoff generated from rainstorms and threatens to replace the visual amenities of rural and pastoral landscapes with unsightly factories and dense housing (Mekvichai et al. 1990).

2.36 Notwithstanding these potential negative impacts, the loss of agricultural land is not a serious problem for most rapidly growing cities. The conversion of agricultural land to urban residential or industrial use reflects its lower value relative to the value of urban land. In Bangladesh, for example, land conversion around Dhaka City is occurring at a rapid rate largely because it is more profitable for small farmers to sell their non-flood-prone land and move to the city (see Box 8). Competition for this land by expatriate workers and high-income individuals has driven up land prices 40 to 60 times faster than the prices of other goods and services. Land prices are now completely out of line with per capita incomes (United Nations 1987). In the Bangkok Metropolitan Region as well, the competition for land has led to land prices higher than the income potentially derived from agricultural products. From the landowner's point of view, selling the agricultural land is more economically attractive than farming or renting out the land for agriculture. Moreover, the salaries of tenant farmers are usually lower than those of industrial and urban service workers. If they found better employment opportunities in cities, they would leave the farms (Mekvichai et al. 1990).

### Excessive Urban Sprawl

2.37 Urban sprawl refers to development on urban peripheries characterized by scattered low-density development, incomplete infrastructure, excavated ground, and vacant lots. The extent of urban sprawl varies by city; it may range from a one to two kilometer wide crown around the city

or constitute a large part of the built-up area and occupy a land as much as 10 or more kilometers wide. The problems associated with urban sprawl include inefficient use of land (that is, under-utilization of land or infrastructure); excessive energy consumption and air pollution due to greater use of motorized transport; and high costs for providing infrastructure. Critics of urban sprawl also cite its negative effect on aesthetic quality.

2.38 Although there is a general consensus among urban and environmental planners that urban sprawl is something to avoid, some view urban sprawl as a temporary phenomenon—the embryonic stage of an urban area before it becomes fully integrated into the surrounding urbanized zone. According to Bertaud (1991), the rate of transformation of the sprawl belt into a fully developed urban area can take from six months to ten years. The longer the gestation period in a given city, the larger the sprawl belt and the higher proportion of households living within it. The size of the sprawl belt and rate of its transformation will depend on prevailing regulatory and land tenure systems as well as the proximity of infrastructure.

### III. FACTORS THAT PERPETUATE LAND-USE PROBLEMS

3.1 In most Third World cities, poorly functioning land markets and inadequate management of land and environmental resources—both of which exacerbated by rapid urban growth—have caused significant negative impacts on land and other environmental resources. The remainder of this chapter examines specific deficiencies in land management and other conditions that must be understood in order to reverse the environmental problems discussed above, including inappropriate regulation; lack of secure tenure; inadequate infrastructure capacity; inadequate information; inappropriate pricing and taxation; and weak institutions and poorly coordinated land management institutions.

#### **Inappropriate Regulation**

3.2 Inappropriate regulation is probably the most important factor accounting for losses of ecologically and culturally important resources as well as the occupation of low-income populations on hazard-prone lands. In some cases, the problem lies in over-regulation, whereby land development standards artificially reduce the supply of land by requiring large lot sizes or excessive amounts of land for circulation. Because of the subsequent rise in land and housing costs, the poor may be forced to squat illegally on vacant land, often in hazard prone areas. When housing prices rise, many governments may intervene to control prices, often discouraging private incentives to supply housing. In other situations, governments have not formulated effective land use policies, laws, and standards that address development in sensitive areas and hazard-prone lands or have not adequately enforced existing land use regulations.

#### ***Excessive regulation***

3.3 By reducing the amount of land in the formal market, excessive restrictions and standards applied to urban land development have increased costs and thus constrained access by low-income populations to safe lands in desirable locations. In Serpong (south west of Jakarta), for example, a master plan for the year 2005 requires only 34 percent of the total land area to be used for residential purposes (World Bank 1993). The areas zoned residential (where formal development is allowed), however, do not necessarily coincide with land that is ready for development or where developers feel that residential demand exists. Consequently, the supply of land for formal development is limited to approved residential zones and where actual demand exists. In Serpong, however, a large part of the area zoned residential has no direct road access and will be served by infrastructure built in the future. Because no developer can risk acquiring land in areas without immediate access, the area of land that can be developed on the market is further reduced. Consequently, the area that is both directly accessible and authorized for housing by the zoning plan is only about 15 percent of the total residential land area (Bertaud 1989).

3.4 In addition to restricting land uses, Serpong's master plan imposes controls on population densities that are usually much lower than those prevailing in most middle-income residential areas in Indonesia. For example, the allowable densities in residential areas in Serpong have an average of 56 persons per hectare. By contrast, the densities in middle-income residential areas where these restrictions do not apply vary from 300 to 500 persons per hectare, which corresponds to plot sizes ranging from 60 to 90 square meters. The average plot size per household

that corresponds to the permissible density is 500 square meters, which would be affordable by only about five percent of the urban population (Bertaud 1989).

3.5 Excessive subdivision regulation is another factor that reduces the supply of urban land for development and therefore increases its cost. In numerous cities, local governments have adopted standards for building materials, road surfaces, plot sizes, and floor areas that are comparable to standards found in developed countries:

- In India, the Madhya Pradesh land use regulations resulted in residential standards that were affordable to only the wealthiest 20 percent of households. Because they could not afford such formal housing (or the transport costs), the victims of the 1984 Bhopal accident (*see* Box 6) were forced to live in the squatter settlements located near the Union Carbide factory (Bertaud 1992).
- In Malaysia, the required area per household to be provided for roads, setbacks, and some community facilities has been up to four times larger than is required for a similar range of plot sizes for comparable projects in other Asian countries as well as in Europe and the United States. Based on this comparison, a World Bank study concluded that about 25 percent of the land developed for residential purposes is wasted (1989). Further, building to these standards, which generally exceed minimum requirements for public health and safety, raises the costs of housing and commercial property beyond the reach of low-income groups. Consequently, the poor are restricted to housing that lacks even the most basic public health provisions.
- In Jakarta, the establishment of minimum legal standards for a dwelling establishes implicitly a de facto “minimum standard income.” If households fall below this “minimum standard income,” they have to obtain shelter through the informal sector. Although households in the informal sector normally are well tolerated and have few risks associated with insecure tenure security, they must forego a number of benefits reserved for the formal sector (for example, access to housing finance). In this way, poor households must pay either a direct cost if they decide to meet minimum standards and thus pay more for shelter, or an indirect cost if they cannot afford the minimum standards and lose the benefits of the formal sector (Bertaud 1989).

3.6 In many countries, excessive technical land survey regulations—which require precise, time-consuming, and costly land surveying techniques, as well as complicated procedures for obtaining clear title and development approvals—present bottlenecks in acquiring and developing land and therefore lead many households to obtain land and housing in informal settlements or subdivisions, often located on hazard-prone lands on the peripheries of cities. For example:

- Land titling in Peru requires 207 bureaucratic steps involving 48 different agencies which takes 43 months to complete. The cost for land adjudication alone is over US\$2,000 per plot. For those earning the monthly minimum wage, this would require paying out his or her entire income for four years and eight months (deSoto 1989).

- In West Java, Indonesia, it takes an average of 32.5 months to acquire title to a property. In addition to time, complex titling requirements add between 10 and 29 percent to the cost of land acquisition.
- In Kuala Lumpur, Malaysia, stringent development standards as well as complicated and time-consuming procedures to obtain necessary subdivision approvals from about 55 separate government departments were principal factors accounting for the increase in new housing prices by 3 to 4 times the annual income of a typical urban household in the 1970s to 5.5 to 7 in the 1980s. During the same period in Bangkok, Thailand, where the entire subdivision approval process takes approximately 100 days, the price of housing in relation to annual income fell over the same period from roughly 5 times income in the 1970s to about 2.5 times income in the mid-1980s, thus making available newly built housing to households with incomes falling as low as in the 20th percentile of the income distribution (World Bank 1993).

### ***Inadequate regulation***

3.7 Although excessive land regulation has constrained the supply of land in some developing country cities, lack of effective land policies and inadequate regulatory frameworks and weak enforcement are other major factors accounting for land degradation and the occupation of hazardous areas. In many cases, there are no effective controls to regulate land use in wetlands, coastal zones, or other sensitive land areas or to prevent haphazard development patterns associated with urban sprawl. Similarly, there is a general lack of appropriate land use controls and building codes applied to development in hazard-prone areas. To make matters worse, there are few trained professionals available in developing countries to prepare plans and formulate appropriate development regulations. Technical guidelines for managing land to meet both environmental and developmental objectives rarely exist.

3.8 With respect to cultural resources, many city administrators and planners often are unwilling to become involved in cultural preservation largely because they equate progress and modernization with urbanization and industrialization (Isar 1986). In many cities, conservation of historical buildings and environment is considered to be sentimental and obstructive to national development objectives. Effective legislation, therefore, is seldom introduced or implemented in developing country cities. Sites of cultural value have been and continue to be violated by major industrial and public works projects as well as conflicting land uses on adjacent properties.

3.9 Inadequate zoning compromises the integrity of historic property or districts in many ways. It may allow inappropriate uses or densities around historic properties or districts. For example, excessive density can result in traffic congestion and consequent deterioration of historic buildings and monuments from air pollution; tall buildings can overshadow historic properties. Inadequate design standards in adjacent zones can also detract from the integrity of historic districts. In addition, zoning that allows high-density development (in excess of the density of the existing structure) can encourage market pressure for demolition because the lot may be more valuable vacant (Mantell et al. 1990).

3.10 In some cases, poorly conceived policies to protect land and cultural resources have had the effect of increasing their vulnerability. For example, in the historic centers of many developing country cities, the property market is controlled by out-of-date laws that establish a different legal situation for historic areas than for the rest of the city. Generally, the laws and regulations meant to protect the city's heritage in reality limit the possibilities for economic use instead of providing economic incentives through tax exemptions, credits, or other forms of subsidies or penalties to encourage conservation or rehabilitation. Consequently, these laws encourage the progressive deterioration of these centers because anyone who might be interested in historic preservation does not have the financial resources to do so. A similar situation arises under rent control. Much of the residential property in many historic centers is subdivided and rented out. Under rent control, neither owners nor tenants take responsibility for maintaining buildings (Hardoy and Gutman 1991).

3.11 In other situations, local authorities may design appropriate regulations but fail to properly implement and enforce them. In Izmir, Turkey, for example, engineers and planners have taken steps to incorporate natural hazard risks (that is, earthquakes, landslides, and flooding) into the planning process. Some areas that are particularly vulnerable to earthquakes have building restrictions forbidding construction of commercial or high density structures. For earthquake-prone areas, there are national construction standards, but no requirement that all designs for structures be reviewed for compliance with standards as part of the construction permit process (World Bank 1989).

3.12 Land use laws forbidding development in hazardous areas sometimes exist, but they are not adequately enforced because either the city does not have the resources to hire inspectors or those that are employed are so poorly paid that they are susceptible to bribes. Moreover, it is difficult to prevent the poor from building on these lands because they cannot afford to live elsewhere. Most cities do not have adequate resources and policies to provide alternative housing for these low-income populations. In some cases, the authorities have resettled households, but other migrants quickly take their place (*Urban Edge* 1991).

3.13 In some cities, laws restricting development in hazardous areas can actually encourage occupation by low-income populations. In Morocco, for example, the government declared certain portions of Rabat off limits for permanent housing; these zones were on the steep slopes and adjacent salt marshes bordering the river that divides Rabat and Sale. Because these lands could not be used for "higher" purposes, the regulation essentially directed squatters to settle on them. By outlawing permanent housing, therefore, the local authorities actually prevented the normal progression from unstable shacks to improved and more inhabitable structures (Boross 1991). Similarly, unenforceable zoning of large green areas has encouraged squatting, leading to the disappearance of accessible parks and open space.

3.14 Another example of a poorly conceived policy to improve the accessibility of urban land for the poor is the Indian Urban Land Ceiling and Regulation Act of 1976, which was intended to reduce land speculation and to distribute land to the poor more equitably in urban areas by imposing a ceiling on the amount of vacant land that could be owned by an individual. Land in excess of this ceiling was to be sold to the government, primarily to provide sites for affordable housing. The effect of this law, however, has been disastrous. The government managed to acquire only a small fraction of the excess and most of the resulting housing was not aimed at low-income households. Moreover,

the act effectively froze the urban land market as property owners took advantage of its slow appeal process. As a result of this contraction in the supply of land, the price of land remaining on the market substantially increased to levels well outside the reach of even the lower middle classes (U.S. AID 1990 and D'Souza 1993).

3.15 Lastly, few national and local governments have accepted land use control as a major priority. Land use policies and regulations, therefore, have not been formulated and explicit objectives for protecting resources and low-income populations have not been established. Although numerous planning activities attempt to establish a physical form or design for an urban area, they usually are undertaken without regard to questions of efficiency, equity, and adaptability. Further, numerous codes, ordinances, and other instruments have been adopted from developed countries which have very different land and construction conditions. In most cases, these controls have been unenforceable because they are unrealistic or have been formulated without consultation with public or private interests and therefore lack political acceptance and adequate incentives to prevent inappropriate land conversion or development. In addition, too little attention has been given to establishing standards appropriate to the economic condition of the population.

### **Inadequate Information**

3.16 In most developing countries, the inadequacy of land information poses a severe constraint on land market transactions as well as land use and environmental planning, property taxation, resource management, and hazard mitigation. Specific information deficiencies relate to parcel-based land information (land ownership, land values, land use); environmental information (ambient environmental quality, waste management practices); health conditions; housing conditions; and natural hazards and associated risks.

3.17 With respect to the land market, the necessary data for land transactions are either not readily available or drastically outdated and incomplete. The legal cadastre may account for only a small portion of urban land; legal rights to most properties are unclear as many remain under tribal or customary systems of land tenure. In many cases, there are conflicting titles to the same or overlapping land parcels. Complex tenure arrangements complicate the situation further; the lengthy legal and technical procedures necessary for clarifying ownership delay real estate transactions considerably. In Accra, for example, conflicting customary and modern systems of titling and land registration have resulted in the filing of 16,000 legal claims over disputed properties. Subsequent litigation has forced land development on the fringe of Accra to a halt (Acquaye 1989). In these situations, the time and costs involved in resolving disputes and obtaining clear title lead many households to obtain land and housing through the informal sector. In many cases, this informal housing is located on hazard-prone lands on the peripheries of cities.

3.18 Inadequate tax rolls or fiscal cadastres have direct implications for financing urban infrastructure which can expand the supply of serviced land in the formal market. Not only is the number of properties recorded very low, but the assessments are usually far out-of-date and greatly reduced by inflation. These inadequate fiscal records, in addition to outdated land assessments and poor collection procedures, results in property tax revenues being only a very small fraction of municipal revenues. In many developing country cities, the urban poor are the groups most often ignored by urban services. Lack of financial resources also means that existing infrastructure cannot

be properly maintained, thus increasing the vulnerability of lands and inhabitants in hazard-prone areas.

3.19 Without land use and environmental information on the resources to be managed, it is extremely difficult for local authorities to establish effective regulations and policies that affect hazard-prone areas or sensitive natural and cultural resources. For example, to manage hazard-prone land, information is needed on existing land uses and densities, waste management practices, locations and capacities of existing utilities and services, local health conditions, location and extent of natural hazards, land conversion rates, locations of vulnerable populations, and the economic and social characteristics of local populations and activities. Similarly, protecting cultural resources requires responsible agencies to keep inventories of historic properties, monuments, and other resources. Most countries, however, lack sufficient accurate, timely data (as well as the capability to interpret the data) on many of the above. This inhibits the formulation, implementation, and enforcement of land management schemes as well as broader environmental management strategies. Lack of such baseline data also undermines adequate environmental assessment of proposed development projects to be located in or adjacent to sensitive areas.

### **Lack of Tenure Security**

3.20 The pervasive lack of secure tenure and poor titling and land registration systems in many developing countries poses a considerable constraint on urban land markets and therefore has a profound effect on the ability of the poor to acquire safe land for housing. One of the major implications of a poor titling and land registration system is the inability of landowners to gain access to formal credit sources because they cannot use their property as collateral. In most situations, banks will not provide loans for home improvements without a clear title. Moreover, in the absence of secure tenure, residents have little incentive to maintain their dwellings or invest in improvements, thereby increasing the vulnerability of the area to floods, earthquakes, and other hazards. According to Dowall and Clark (1991), studies on informal settlements reveal that as security of tenure increases, households invest more resources in upgrading their residences. Moreover, local governments, who normally do not provide adequate urban services to illegal settlements, are obliged to extend municipal services to households occupying legally titled land.

### **Inadequate Infrastructure Capacity**

3.21 The lack of adequate infrastructure is another principal factor accounting for the degradation of resources as well as losses associated with the occupation of hazard-prone land. Few city governments can meet the demand for services in rapidly growing cities. In the squatter communities or illegal subdivisions located in hazardous areas, the lack of adequate infrastructure and services make the land as well as its inhabitants particularly vulnerable to natural hazards. In the case of cultural resources, inadequate wastewater disposal and drainage systems are responsible for substantial damage to historic properties.

3.22 The inability of local governments to provide the necessary infrastructure and services is due in large part to its failure to consider appropriate technology. In many Third World cities, authorities invest in capital intensive technologies used in industrialized countries; the implementation of these systems has been hampered by lack of demand and shortage of investment funds. Other deficiencies are poor management of urban services and infrastructure as well as the inability of local

governments to mobilize the necessary financial resources. In large part, the failure of local governments to acquire the necessary funds to extend infrastructure services is due to their inability to recover the costs of their infrastructure programs from the increase in land values that they generate.

### **Inappropriate Pricing and Taxation**

3.23 Because many of the benefits of conserving sensitive land resources (that is, wetlands and coastal areas) are difficult to measure, the value of conservation rather than development often is underestimated. This leads to a bias toward development. Since the benefits of protection are underestimated, the costs of protection in terms of development opportunities that must be given up (as well as government expenditures to acquire and manage a protected area) appear considerable. Consequently, a smaller amount of land is protected than would be if there was a full accounting of all the benefits and costs associated with each alternative land use (Dixon and Sherman 1990).

3.24 In the case of protecting cultural resources, the costs are usually easy to quantify, while the benefits of preserving cultural resources are generally under-valued. In some cities, property owners perceive that tearing down historic properties and building new structures is more profitable than rehabilitation and reuse. Nonetheless, analysis of this situation in countries such as Antigua and Barbuda indicates that the conservation option is the more profitable option. The internal rate of return from preservation of historic buildings is generally greater than demolition and new construction. The amount of capital required is generally a fraction of that required for new construction and the risk is proportionately smaller. Profitability, however, is affected by the projected use of the historic building; if the historic building can be used for retail trade with tourists, preservation is usually an economically favorable option (Taboroff 1991).

3.25 Inefficient tax policies are significant factors encouraging urban sprawl. For example, low or non-existent property taxes and the absence of development fees or special assessments to cover the cost of publicly provided infrastructure not only subsidize the landowner but enable landowners to tie up parcels of land unproductively, at relatively low cost to themselves, while forcing the government and their neighbors to assume additional costs of extending infrastructure to pay for urban sprawl. As mentioned earlier, inadequate property tax systems constrain the ability of most developing country cities to finance infrastructure as well as improved land titling and registration systems. The property tax system in most developing countries is undermined by poor coverage, out-of-date property assessments, and inadequate collection and enforcement systems. In addition, local governments have not applied effective policies for collecting development fees, exactions, user charges, or other charges that could finance new or improved services and thus expand the supply of serviced land.

### **Weak Institutions and Poorly Coordinated Actors in the Land Market**

3.26 Lastly, weak institutional capacity undermines most government efforts to manage urban land and cultural resources effectively. This encompasses lack of expertise in environmental planning and management, inadequate financial resources, and inadequate or lack of private sector and community involvement. Additionally, there can be many public and private actors that formulate plans or policies or make investments in urban land. For example, national land administration agencies, state planning departments, urban development or municipal housing

authorities, land and urban development agencies, infrastructure departments, and urban planning officials all have roles in urban land management. To further complicate this situation, there are traditional land authorities as well as private organizations that are significant actors in urban land markets and the provision of housing. National, state, or local land administration agencies also may have a role in determining the use of sensitive land and cultural resources. The private sector, which includes formal land developers, informal land developers, and non-governmental organizations (NGOs) and community-based organizations (CBOs) have divergent, often conflicting interests in urban land.<sup>6</sup> In many countries, however, there is a general lack of coordination as well as conflicts among the various actors involved in land management; the entity making the plans and regulations often is not the one making decisions about public investments and private development. In Indonesia, for example, the fragmentation of responsibilities has led to a virtual impasse in land-related matters (World Bank 1990).

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6. See Farvacque and McAuslan "Reforming Urban Land Policies and Institutions in Developing Countries" (Urban Management Program Policy Paper Number 5, 1992) for a more detailed discussion of the roles of these actors in urban land markets and urban land management.

## IV. NEED FOR INTEGRATED LAND MANAGEMENT STRATEGY

4.1 Notwithstanding the failures of government interventions in urban land markets, some degree of government control must be exerted over urban land use and development. Without effective policies and regulations, it is unlikely that private actors in the land market will take into account the costs that their decisions concerning the use, density, design, location, and timing of development may impose on sensitive land and cultural resources. At the same time, government policies and regulations should not unnecessarily constrain the supply of land for residential use or discourage the private sector from providing affordable housing for low-income populations in safe locations. For cities undergoing rapid expansion, therefore, one of the most important challenges is to achieve a proper balance between urban development and environmental protection, taking into account the inter-relationships among land use, poverty, and the environment. This chapter presents a strategic approach for balancing these objectives.

### **Land Management Strategies for Balancing Environmental Protection and Urban Development**

4.2 Each city has its own unique environmental problems. The nature and extent of those problems that relate to land use and development will vary according to the physical, demographic, cultural, and economic conditions of a particular setting as well as the needs, responsibilities, and capabilities of the various public and private actors in the land market. Moreover, the nature of the problem will determine the actors who should be involved in problem solving as well as the range of possible solutions. In most developing country cities, however, balancing environmental and urban development objectives will require a land management strategy that both protects sensitive resources and facilitates the urban land market.

- **Protect priority resources.** Protecting priority land and cultural resources involves 1) managing development in specific areas through special controls, development standards, or taxes—coupled with effective enforcement, and when necessary, provision of alternative sites for development; 2) encouraging preservation through tax or other incentives; and 3) improving citywide environmental management to limit adverse externalities as well as guide development to environmentally suitable land. The identification of priority resources requiring special protection should be based on the outcome of a participatory planning process.
- **Facilitate the land market.** Improving the functioning of the land market so as to promote resource protection and reduce urban sprawl involves 1) providing urban infrastructure to reduce developers' risk and encourage development where desirable; and 2) adopting land development regulations that are flexible, appropriate to local conditions, and involve a minimum of administrative requirements.

4.3 To implement such a two-prong strategy, there is no one set of policies and policy instruments that will be effective under all conditions. Urban land managers in each city will need to conduct an in-depth assessment of local land conditions (including natural features, land use, land

conversion rates, land policies, land laws and regulations, land tenure, land institutions, land administration, and formal and informal land market)<sup>1</sup>—and through a local participatory planning process—negotiate priorities and design locally appropriate strategies, policies, and investments, taking into account the cost and benefits of each approach, the available instruments, and the range of actors involved, including the necessary institutional arrangements that would facilitate the strategy. Whether this planning process occurs as part of an urban environmental planning and management framework<sup>2</sup> or a broad land management plan for an urban area, the overall goal should be to ensure that land use patterns foster economic growth and minimize environmental costs.

### *Strategic approaches*

4.4 Removing distortions in urban land markets and establishing effective systems of land management will require substantial reforms at both the national and local levels. As discussed earlier, addressing all of the issues involved extends beyond the scope of this paper.<sup>3</sup> Nonetheless, the following recommendations highlight some of the most promising approaches to resolving the land management issues covered. Interventions range from those requiring the least stringent land use regulations to those involving bans on certain types of land use in designated locations.

#### **Protect Sensitive Land Resources**

- *Improve citywide environmental management.* Under this approach, environmentally threatening activities in sensitive areas would be minimized as part of a broader environmental management framework. For example, if open dumping of solid waste is threatening wetlands, the solid waste authorities should ban open dumping and require further improvements in the municipal solid waste management system (i.e., the designation of sites for sanitary landfills, establishment of an effective enforcement system) to ensure that illegal dumping ceases.
- *Establish buffer zones.* Creating buffer zones around sensitive areas not only can provide protection, but serve other public purposes as well. For example, as part of the Guarapiranga Reservoir water catchment project to be implemented in Sao Paulo, the government will protect water quality by providing sewerage to the majority of illegal settlements as well as by creating buffer zones around sensitive parts of the reservoir to restrict further settlements. As part of this

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1. See the "Urban Environmental Indicators Questionnaire" (Urban Management Program 1992) and David E. Dowall "The Land Market Assessment: A New Tool for Urban Management" (Urban Management Program Tool, Number 4, 1992) for guidance on collecting land market information.

2. See Carl Bartone, Janis Bernstein, and Josef Letimann, "Toward Environmental Strategies for Cities: Policy Considerations for Urban Environmental Management in Developing Countries" (Urban Management Program Paper 1993), which presents a process of formulating urban environmental strategies and action plans that cover land management considerations.

3. See Catherine Farvacque and Patrick MacAuslan, "Reforming Urban Land Policies and Institutions in Developing Countries" (Urban Management Discussion Paper Number 5) and David Dowall and Giles Clarke (Urban Management Program Discussion Paper Number 7) which recommend policies for the reform of land management practices and institutions as well as improving urban land markets.

management scheme, the government will provide concession contracts to the private sector to manage these zones as public recreation areas.

- *Allow development or redevelopment of some critical zones (i.e., coastal areas) accompanied by the necessary impact mitigation measures.* This approach recognizes that all critical environmental areas are not equal. The nature and severity of the land problems would determine which areas of the city should not be occupied under any circumstances and which areas can be developed once the necessary infrastructure or other impact mitigation measures are in place (i.e., use restrictions, appropriate infrastructure, required building materials and design specifications).
- *Guide development to environmentally appropriate sites, while banning development on land having significant ecological value.* Under this approach, urban land authorities would provide primary infrastructure to sites where development is desirable, and/or where services permit, increase allowable densities in existing urban areas. At the same time, the local authorities would ban residential, commercial, and industrial development where it would cause irreversible damage to priority resources. In some cases, it may be necessary to relocate households occupying environmentally fragile land to comparable housing on alternative sites near employment opportunities as well as provide appropriate compensation. It also may be necessary to dedicate wetland areas as parks or protected areas and provide the necessary management controls, including strong enforcement mechanisms, to prevent incompatible land use and environmentally destructive activities.

### **Manage Hazard-Prone Lands**

- *Improve citywide environmental management.* As in the case of protecting sensitive land resources, the management of hazard-prone areas should be part of a broader approach to urban and environmental management in a city or larger metropolitan area. In Benin, for example, the entire capital city of Cotonou is located on a narrow strip between the Atlantic Ocean and a coastal lagoon, and is subject to serious flooding. Nearly one half of the city's settled areas are inaccessible during much of the year due to the long neglect of road and drain maintenance. Existing undeveloped land in the city lies over sensitive groundwater resources used for drinking. To improve conditions in this situation, the government is investing in extensive citywide infrastructure improvements (including sanitation and drainage) as well as improvements in the management of urban services, local fiscal resource mobilization, and urban management capacity (World Bank 1991).
- *Clarify land tenure.* Although experience in various countries has demonstrated that low-income settlements can evolve into highly desirable locations regardless of the original tenure situation if incomes increase, investments are made, and safety from hazards is maintained, legalizing land tenure in many develop-

ing country cities can encourage households to invest in improvements that will withstand hazards. This action also should oblige public agencies to provide urban services. Where land tenure will be legalized, however, additional measures must be taken (i.e., physical barriers, surveillance) to ensure that the regularization process does not encourage further invasions of hazard-prone lands.

- *Allow appropriate use of hazard-prone areas.* Where development has not already occurred in hazardous zones, land managers should plan for compatible land uses. For example, the land adjacent to heavy industry should be used for light industry or commercial establishments. This land can also be used for parks or other open space uses provided that the necessary management controls are in place to prevent illegal settlement. Where appropriate, municipal authorities can designate some hazard-prone lands as public parks to provide for public recreation. In Curitiba, Brazil, for example, areas along water bodies subject to flooding have been transformed into linear parks and made available to the population for recreational purposes (Rabinovitch and Leitmann 1993).
- *Ban development only where hazardous conditions cannot be mitigated through appropriate servicing or building standards.* In most developing countries, low-income populations occupy hazard-prone land because it may be the only affordable land accessible to employment centers. To improve living conditions in these areas, the government should provide the necessary urban services, require the appropriate building codes, or encourage private sector services to mitigate potential hazards. Where urban services and building standards cannot provide the necessary degree of protection, the local authorities should impose land restrictions accompanied by alternative sites for land occupation (see below) and the necessary enforcement measures (i.e., physical barriers, surveillance) to ensure that new migrants do not take the place of the relocated groups.
- *Provide alternative safe sites for low-cost housing.* Any restrictions on land occupation in hazardous areas must be accompanied by the servicing of alternative sites or by increasing allowable densities in designated urbanized areas. Otherwise, development bans, which place constraints on the land supply, will have negative repercussions for the urban poor, who will be forced to locate on land inaccessible to employment opportunities and urban services or increase excessively the density of accessible inner-city areas. Because land restrictions constrain the land supply and raise land consumption in some areas, it also is necessary to reduce regulatory constraints and improve the functioning of land markets so as to expand the supply of affordable housing in the formal sector.

### **Protect Cultural Resources**

- *Clarify land tenure.* Clarifying tenure and registering properties in a legal cadastre is another means of promoting the conservation of cultural resources. Legalizing land tenure will often enable owners of historic properties to obtain

financial credit to allow them to invest in housing improvements that will help conserve historic features. Such a conservation strategy, however, cannot be successfully implemented against the will of property owners who may fail to register their properties because of their resistance to paying the property tax.

- *Establish flexible controls on the uses of historic buildings so as to allow adaptive reuse and ensure preservation.* When accompanied by efforts to expand the economic base (i.e., by attracting investments and creating jobs) as well as to provide the necessary incentives and institutional mechanisms, local authorities can encourage the restoration and conservation of historic buildings or historic districts by allowing the private sector to adapt historic buildings to meet new uses. In Tunis, for example, the Association pour la Suvegarde de la Medina (ASM) has restored thirteen old madrassahs with a view to renting space for a viable amount to professional associations of lawyers, doctors, journalists, and architects. This kind of adaptive reuse, aimed at matching suitable clients with space in restored buildings, is intended to expand the economic base of the old Medina while ensuring proper maintenance and use of the existing buildings (Serageldin 1992). As proposed in Serageldin (1992), one approach to encouraging adaptive reuse is to establish a geographically defined *Historic Area*; create an Historic Area Development Corporation (HADC) composed of public and private actors; and define the mandate of the HADC, which would be to restore all monuments, define and enforce all building codes and regulations to conserve the character of the historic area, and undertake the mandatory review of all new construction within that area.
- *Register and protect priority cultural resources.* To protect cultural heritage, it will be necessary to identify and register historic buildings requiring special protection and then determine how it should be accomplished within the context of continued urban development and growth. Local authorities should also allow partial conservation and new infill construction within parcels containing heritage buildings. Where cities contain numerous historic buildings or cultural resources, it may not be possible or even desirable to preserve all of the buildings. While destroying cultural heritage may impose substantial costs, the replacement of deteriorated historic structures by modern high-rise construction may bring potential benefits to a city in increased property tax revenues, housing units, and employment. Moreover, owners of historic properties are likely to resist preservation unless they receive compensation for the added costs associated with preservation. Unless these owners are compensated through such measures as tax credits or allocation of development rights elsewhere, the listing of their properties in an historic register will impose excessive financial burdens and lead to further deterioration.<sup>4</sup>

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4. In Bombay, for example, there are cases where historic structures are in serious disrepair, but the owner cannot afford the high costs of restoration. The owner cannot sell his property because the designation substantially lowered the site's market value and the tax authorities are raising the assessment based on the site's location in a prime residential area. The owner, therefore, is being driven to bribery to get his property removed from the list of historic properties (D'Souza 1993).

### **Conserve Open Space**

- *Delineate and protect open areas, as identified through a public planning process, that will meet the minimum needs of the urban area for recreation, drainage, or aquifer recharge.* Protecting open space should be avoided where shortages of urban land are elevating housing costs and pushing the poor out of the legal land market. Nonetheless, where a public planning process has identified the dwindling supply of open areas for drainage, aquifer recharge, or recreation as an important environmental concern, local authorities can preserve at least the minimum amount of land required for these purposes. In Curitiba, for example, where prior to 1975 one of the most serious problems confronting the city was severe flooding due to building along streams, strips of land for drainage were created and the development of land hollows was forbidden. The stream protection strips were developed as linear parks and water bodies were protected by law with a comprehensive tree planting program. Other areas subject to flooding also were transformed into parks. As a result of these measures, the drainage system was effectively preserved and the population was afforded substantially greater opportunities for recreation (Rabinovitch and Leitmann 1993). Other measures for conserving open space are discussed in the section on protecting sensitive land resources.

### **Discourage Excessive Urban Sprawl**

- *Clarify land tenure and implement other regulatory reforms that would improve the functioning of the formal urban land market.* Facilitating urban land markets will go a long way toward making larger amounts of urban land available for housing and thus reduce development pressures on urban peripheries. Specific measures include increasing allowable densities in existing urbanized areas, encouraging historic property preservation and rehabilitation, clarifying land tenure, and streamlining the land titling and development approval process. Any attempt to control the sprawl belt through physical limits and boundaries will only exacerbate this land use problem.
- *Establish rights-of-way for primarily infrastructure.* One traditional approach to minimizing the negative effects of urban sprawl is to guide new development through the establishment of transportation and other urban infrastructure. In Curitiba, Brazil, for example, urban growth has been encouraged along five main axes with “structural” roads. Each axis is designed as a “trinary” road system with a central lane for express buses flanked by two local ones and two high capacity free-flowing streets going in opposite directions. In the areas adjacent to each axis, the land use legislation has encouraged high density occupation, together with services and commerce. One important complementary activity to the road system was the municipal government’s acquisition of land along or close to the new transport axes, prior to their construction. This allowed the government to organize high density housing programs close to the transport axes. Some 17,000 lower income families were located close to these

axes. Curitiba's public transportation system also has helped the city save up to 25 percent of fuel consumption city-wide and is directly responsible for the city having one of the lowest rates of ambient air pollution in Brazil (Rabinovitch and Leitmann 1993).

### **Manage Prime Agricultural Land**

- *Allow urbanization of prime agricultural land.* The measures to discourage urban sprawl (discussed above) are the principal means for either avoiding the loss of prime agricultural land or promoting the orderly conversion of agricultural land to urban use. Additional restrictions on such conversions, however, are not recommended. Although it is possible that a reduction in the rate of land conversion can improve the overall food security of a country, there is no evidence that any country has successfully limited land conversion without creating serious inflationary pressure on land prices for other uses. For example, Japan has artificially preserved agricultural land, but it has resulted in the inflation of rice prices to seven times the world market price and inflated the cost of residential housing to the highest in the world (Mekvichai et al. 1991). In most countries, the loss of agricultural land can be compensated for by importing food or increasing the productivity of remaining farms.<sup>5</sup>

### ***Measuring costs and benefits***

4.5 As indicated in the recommendations above, land management to meet environmental objectives is not cost free. In formulating strategies, each approach will need to be carefully evaluated in terms of its costs and benefits to both public and private sectors, local communities, vulnerable populations, as well as the environment. In the case of wetlands protection, for example, cost considerations include the costs of government resource protection efforts as well as the costs for not establishing effective controls. The costs of protection include the direct costs for establishing, implementing, and enforcing special management controls; indirect costs of protection (i.e., increased urban land prices); and opportunity costs (i.e., lost revenues from farming or commercial development, lost property tax revenues). By contrast, the costs for not protecting the wetlands include direct damage costs (i.e., property and infrastructure damage due to floods); costs for mitigating impacts (i.e., costs for providing new drainage systems); and lost option values (i.e., lost revenues or benefits from potential future use).

4.6 While some of the benefits of wetlands protection can be measured in monetary terms (i.e., income from fisheries), other benefits—such as those associated with protecting wildlife habitat or aesthetic values—may be more difficult to assess. In some cases, certain wetlands may produce a variety of benefits from their potential use in the future, either through tourism or products that may be derived from the area's genetic resources. In evaluating the costs and benefits of wetlands protection, analysts must take into account that wetland services can vary substantially from one wetland to another as well as from one location to another. Each wetland, therefore, must be evaluated

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5. In some cases, artificially depressed agricultural prices are responsible for excessive conversion of agricultural land. The solution, therefore, lies not in land management techniques, but in removing distortions in the pricing of agricultural products.

on an individual basis to determine its actual benefits and the potential costs of protection. In the United States, for example, the Army Corps of Engineers estimated that the loss of the entire 8,422 acres of wetlands within the Charles River Basin, Massachusetts would produce average annual flood damage of over US\$17 million (Office of Technology Assessment 1984). Where a wetland provides such significant flood control services, strict development restrictions are warranted. Where a wetland area is not as economically important, it may be difficult to justify restrictions when there are scarce land resources for housing the poor.

4.7 In formulating strategies for hazard-prone areas, land managers will need to evaluate a similar range of costs and benefits. From the government's perspective, for example, the costs of land use restrictions may include direct expenditures for establishing and enforcing controls (i.e., surveillance systems, fencing), making alternative land available for low-income housing and providing adequate public transport from these alternative sites to employment areas, or providing appropriate infrastructure to withstand hazards. From the perspective of the urban poor, the cost of land use restrictions may include relocation costs and higher transportation expenditures from having to locate further away from employment. By contrast, the benefits of restricting occupation of hazard-prone areas can be measured in terms of the costs saved by not having to provide protective infrastructure; subsidize housing built to withstand natural hazards; or provide emergency relief and alternative housing, food, health care, and other services in the event of a disaster.

4.8 Allowing development in hazard-prone areas imposes a different set of cost and benefit considerations. As indicated above, allowing development in certain vulnerable areas may require public investment in infrastructure that can withstand hazards. If the local authorities permit development in these areas without the necessary mitigation measures, however, the government as well as the occupants can be faced with substantial costs in the event of a disaster (i.e., loss of lives; expenditures for health services, relocation of inhabitants, and provision of temporary services; losses of capital stock and inventories; and lost income, employment, or services resulting from lost productive capacity). Anderson (1990) also cites costs resulting from decreases in economic growth and development (i.e., increased public indebtedness, inflation, and balance of trade deficits).

4.9 Protecting cultural resources is another objective that must be carefully evaluated. In some cities, the preservation of architectural heritage is both economically and socially advantageous. Historic structures not only represent a significant capital asset for the economy, but constitute an important tourist attraction and crucial component of the cityscape. The benefits of preserving these resources, therefore, may include increased income from tourism as well as increased jobs, income, and social stability for workers employed in the hotel, transport, communications, construction, and artisan sectors. In some cases, the preservation of historic residential buildings in the central areas of cities may prevent urban sprawl. The costs of preservation, by contrast, include substantial investments in building restoration, construction, or rehabilitation of infrastructure, and in some cases, expenditures for site protection and surveillance. These costs, however, normally will be lower than those associated with new construction.

4.10 The costs of historic property losses may include reduced income from tourism and related facilities and activities (i.e., hotels, handicrafts, transport, communications), and as mentioned above, the spread of uncontrolled low-income settlements on unserviced lands. In the case of residential buildings, property deterioration and overcrowding impose costs associated with unhealthy living conditions (i.e., mortality and morbidity due to inadequate water supply, sanitation,

and solid waste services). Destruction of important historic monuments or landscapes may also impose non-quantifiable costs such as the loss in spiritual values or ethnic pride.

### ***Selecting land management instruments***

4.11 Managing urban land to meet environmental and equity objectives requires a mix of policies and instruments to guide and motivate the behavior of actors causing the land-related problems and those responsible for managing urban land so as to avoid those problems. To implement the land management strategies discussed above, some of these instruments will influence market behavior (i.e., increasing supply by removing excessive land use controls, providing urban infrastructure, or by improving land titling systems); others will affect the land management process through improved regulation, subsidies, or provision of critical information. As described in Table 4, the range of land management instruments falls into six basic categories: regulatory instruments, economic instruments, land acquisition alternatives, property rights, government provision of infrastructure, and information and education.

4.12 No single instrument will be effective in achieving all land management objectives. Urban land managers will need to select the most appropriate instrument or mix of instruments to meet the particular needs, priorities, and special characteristics of each problem and locality. In determining the most appropriate tools, they will need to assess existing and planned land uses; existing land use and other applicable controls that may or may not be appropriate or effectively enforced; existing rates of land conversion; and the extent of the urban or peri-urban land area requiring special protection. In addition, urban land managers will need to consider the following factors:

- **Local attitudes and interests.** What are the social and cultural values of the population? Do landowners want to protect cultural or natural resources or are they interested only in making a profit?
- **Legal authorities.** Do the existing local land management agencies have sufficient authority for implementing and enforcing the chosen instruments?
- **Institutional capacities.** Are there sufficient financial, technical, and managerial capacities and coordination mechanisms to effectively implement and enforce the strategy?
- **Economic and market conditions.** What is the level of economic development and urbanization? Will the instrument be able to withstand development pressures? Will tax incentives have a significant effect on landowner decisions?
- **Efficiency.** What are the long and short-term costs associated with each approach? Typical cost considerations include costs for administration and enforcement, effects on local land prices, and capital and maintenance costs of housing and infrastructure. Does the instrument or mix of instruments achieve the objective at minimum aggregate cost, including costs to both the government and the land users?

- **Equity.** Does the instrument take into account the income levels of land users and landowners? Who pays and who benefits? Do costs fall disproportionately on the poor? Does the instrument ensure that low-income populations are not denied land within the urban area or denied adequate access to services (i.e., employment or transportation)?
- **Adaptability.** Does the instrument ensure that the urban pattern can adapt and change over time as new population pressures and economic activities arise (i.e., does it allow expansion of activities and services as needs arise while enabling conservation of areas or facilities deemed of value to society)?
- **Conflict resolution.** Is there a system for mediating and resolve conflicts between competing objectives at one level and competing uses at another?
- **Political constraints.** Is the selected instrument politically feasible? Are the key decision makers committed to implementing and enforcing the instrument? What steps are needed to make the instrument acceptable at the local and national levels?

4.13 Table 4 summarizes the range of available land management instruments, including their advantages and disadvantages. Table 5 provides more specific information about which instruments are most relevant to meeting specific land management objectives and indicates relative needs for information and expertise as well as administrative costs. Annex A describes each instrument in more detail and provides examples of how various tools have been applied in both developed and developing countries.

#### *Involving relevant actors*

4.14 In managing urban land so as to achieve environmental objectives, there are many cross-cutting issues (i.e., managing development in hazardous areas requires, among other measures, provision of necessary infrastructure, land tenure security, special housing construction techniques, and effective disaster planning; protecting cultural heritage involves, inter alia, strengthening environmental institutions, improved property taxation, and effective urban growth management). Addressing these issues requires action on the part of those actors who are affected by and those who influence urban land use and development and the resulting impacts. This would include national land and environmental protection agencies; ministries of finance, regional and local planning agencies; public and semi-public land development agencies; urban development authorities; traditional land authorities; CBOs; NGOs; private developers; private households; and the media. As mentioned above, the relevant actors should be involved in a participatory planning process with the purpose of formulating as well as implementing the appropriate land management strategies.

#### **Building Land Management Capacity**

4.15 Developing and implementing land management strategies requires a wide range of capabilities, responsibilities, and actions by numerous public and private actors in urban land markets. As illustrated above, formulating land management strategies involves the evaluation of the

costs and benefits of alternative approaches to land and cultural resources as well as public and private actors in the land market. It also involves the selection of locally appropriate instruments. Unfortunately, line agencies in many developing country cities lack the skills to adequately assess the alternatives and communicate the tradeoffs to decision makers. Moreover, most Third World cities lack the necessary information for effectively carrying out any of the available strategies and tools. In developing any kind of strategic approach to land management, therefore, each city will need to assess its capabilities in formulating as well as assessing alternative management approaches. Unless local agencies build up these capabilities, the environmental problems discussed in this paper will continue.

4.16 In most developing country cities, both public and private actors in the land market will have to upgrade their human resources and institutional and technical capacities to enable them to identify, understand, and evaluate complex urban environmental problems associated with land use; establish priorities for action; resolve conflicts; and formulate and implement appropriate land policies and instruments. The necessary capabilities and skills fall into four general categories:

- **managerial** (i.e., policy-making, establishing streamlined administrative processes, establishing and implementing public participation processes, conflict resolution, developing and maintaining land and financial information systems, disseminating information, developing training programs);
- **regulatory** (i.e., setting appropriate land use regulations and building codes, establishing and carrying out effective monitoring and enforcement, drafting new land legislation and regulations);
- **technical** (i.e., environmentally sound land use planning and management, cultural resource protection, coastal zone management, natural resource analysis, risk assessment, economic valuation of impacts, environmental impact analysis, integrated environmental planning, design of land information systems); and
- **financial** (i.e., setting tariff and tax structures, establishing revenue collection procedures, establishing financial incentive programs, capital budgeting).

4.17 Capacity building for both public and private actors should correspond to the role each participant is expected to carry out in the formulation and implementation of land management strategies. The tools for capacity building include training, technical assistance, private sector participation, and public information and outreach. In the course of implementing the strategies, capacity building programs should be routinely monitored and periodically adjusted to reflect changing needs.

## **V. CONCLUSIONS**

**5.1** Throughout the developing world, rapid urbanization coupled with inadequate land management has resulted in degradation of sensitive resources; occupation of hazard-prone areas; loss of cultural resources, open space, and prime agricultural land; and excessive urban sprawl. In most Third World cities, the underlying causes of these problems can be traced to inappropriate regulation, lack of secure tenure, inadequate infrastructure capacity, inadequate information, inappropriate pricing and taxation, and weak and poorly coordinated actors in the land market. Although the nature of the particular land or cultural resource problems will determine the most effective strategy for managing them, most cities will require a two-prong strategy to facilitate urban land markets as well as protect priority resources.

**5.2** To implement such a strategy, there is no one set of policies or policy instruments that will be effective under all conditions. Urban land managers in each city will need to conduct an assessment of local land conditions and design locally appropriate strategies, policies, and investments, taking into account the costs and benefits of alternative management approaches, the roles and responsibilities of a wide range of public and private actors, and available land management instruments. Selecting the right instrument or mix of instruments will involve consideration of prevailing natural, economic, socio-political, and institutional conditions.

**5.3** Because there are many cross-cutting land and environmental issues confronting developing country cities, addressing these issues requires coordinated action on the part of those who are affected by and those who influence urban land use and development and the resulting impacts on land and cultural resources as well as hazard-prone land. To address the environmental problems associated with urban land use, the relevant actors should participate in a strategic and coordinated environmental planning and management process that takes into account the inter-relationships between land and other priority environmental problems in an urban area. They also will need to upgrade their capacities to identify, understand, and evaluate complex urban environmental problems associated with land use; establish priorities for action; resolve conflicts; and design and implement appropriate land policies and instruments. Capacity building for both public and private actors should correspond to the role each participant is expected to carry out in the formulation and implementation of the land management strategies. In the course of implementation, capacity building programs should be routinely monitored and periodically adjusted to reflect changing needs.

**5.4** Unfortunately, relatively little is known about urban land management to meet urban environmental objectives in Third World countries. There is a need for additional research and case study investigation on what are the most effective institutional arrangements, land management tools, and implementation incentives for minimizing land degradation, occupation of hazard prone lands, and losses of cultural resources and open space; what instruments work best under different local conditions; and how to effectively integrate land and cultural resource protection into broader urban environmental planning and management programs.

**Table 4. Land management instruments to meet environmental objectives**

Instrument	Explanation	Advantages	Disadvantages
<b>REGULATORY INSTRUMENTS</b>			
<p>Zoning (Includes large lot residential zoning, agricultural zoning, flood plain zoning, wetland zoning, historic area zoning, cluster zoning, open space zoning, performance zoning, overlay zoning, and open space zoning)</p>	<p>Division of a municipality or other jurisdiction into districts in which use and densities are controlled. Establishes height and bulk of buildings and other structures, minimum allowable lot sizes, minimum setbacks, and population density</p>	<p>Can preserve open space and agricultural land and protect environmentally fragile areas</p> <p>Can exclude certain uses altogether</p> <p>Can restrict development in hazard-prone areas</p> <p>Can preserve integrity of historic areas and structures</p> <p>Can stabilize property values</p>	<p>Can result in inefficient use of land</p> <p>Restricts land supply</p> <p>Requires supplementary controls, well-trained bureaucracy, and adequate enforcement capacity.</p> <p>Cannot ensure long-term protection</p> <p>Often excludes the poor and is biased against newcomers</p> <p>Vulnerable to political and market pressures</p>
<p>Subdivision regulations</p>	<p>Control physical layout of new development by establishing standards (i.e., lot size, street length and width space for public facilities and service)</p>	<p>Can protect environmentally sensitive areas and cultural resources</p>	<p>Can increase land and housing costs</p> <p>Limit land supply</p>
<p>Building codes</p>	<p>Control materials used for constructing new buildings and establish construction standards and techniques</p>	<p>Can reduce losses associated with specific natural hazards</p>	<p>Can raise building costs</p>
<p>Transferable development rights</p>	<p>Allow development potential to be traded or sold by allowing transfers of density between tracts of land that may be under different ownership</p>	<p>Can be used to protect historic properties and agricultural land</p>	<p>Involve complex implementation</p> <p>Require effective zoning enforcement capacity</p>
<p>Moratoria and interim development regulations</p>	<p>Temporary development bans or interim rules designed to restrain development until a protection plan can be developed or implemented or until public facilities related to an environmental problem can be constructed or upgraded.</p>	<p>Can restrain development in sensitive areas</p>	<p>May impede economic development</p>

<b>Instrument</b>	<b>Explanation</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>Environmental controls</b>	National, state, or local air pollution, water pollution, and solid and hazardous waste regulations	Can control waste and pollution and therefore reduce vulnerability of urban populations, natural resources, and property	Require political commitment and effective enforcement capacity
<b>Shoreline exclusion or restrictions</b>	Prohibit or significantly limit certain uses within a strip or band in the coastal zone	Can protect environmentally sensitive resources and can prevent shoreline erosion and blockage of public access	Require strong political support and complementary land or coastal management programs
<b>Critical area protection</b>	Restricts development through some form of purchase, ministerial restriction, or condemnation. May include buffer zones surrounding the resource area or special environmental assessments	Can protect particular types of sensitive environments or natural areas, restrict development in a special floodplains, or preclude development on eroding coasts	Requires strong political support and complementary land management programs and regulations
<b>Slope-density ordinances</b>	Specify percentage of a parcel that may be developed or permitted density based on overall slope	Can restrict development on steep slopes	Require effective enforcement capacity
<b>Historic preservation ordinances</b>	Establish a process for designating historic properties and districts and for the review of alterations to or demolitions of designated historic properties	Can protect cultural resources	Require clear institutional responsibilities and effective enforcement capacity
<b>Permits</b>	Issuance of permits or license is required prior to construction or implementation of proposed development	Can be granted or withheld according to how an entity meets certain conditions	Require strong enforcement capacity
<b>Mandatory policies</b>	Requirements or guiding principles for managing sensitive lands and other resources	Provide framework for issuing permits or preparing land use of special area plans	Tend to be vague on how land and resources in specific geographical locations will be affected
<b>ECONOMIC INSTRUMENTS</b>			
<b>Differential property assessment</b>	Allows land to be assessed on the basis of its current use rather than its fair market value	Can reduce financial pressures that lead to environmentally inappropriate development	Does not provide long-term assurance that property will retain its current characteristics Requires supplementary regulation (i.e., zoning) Requires adequate fiscal cadastres and well administered and enforced property tax systems

**Table 4. (continued)**

Instrument	Explanation	Advantages	Disadvantages
Land gains taxes	Type of capital gains tax applied to increases in land value between the time of initial purchase and subsequent sale or exchange of land	Slow development of open space or agricultural land  Revenues can be used to purchase sensitive lands or interests in other lands requiring protection	Political factors can undermine effectiveness  Can impede land market
Impact and betterment fees	One-time payments made by developers, builders, or industry at the time of development approval, calculated to be proportionate to the cost of providing physical infrastructure and environmental services to increase the carrying capacity of the land while protecting the environment	Can be used for flood protection, parks, recreation, water supply and sanitation, environmental monitoring, and hazardous waste clean up  Shifts burden of financing public infrastructure to private developers	Require effective collection procedures  Increase housing costs
Tourism taxes and user charges	Taxes or charges assessed on transport, hotels, restaurants, or other facilities	Provide funds to support historic preservation	Require willingness to pay
Grants and low interest loans	National governments provide grants or low interest loans to state and local governments or private entities	Provide funds for land protection, historic preservation, industrial relocation, and hazard mitigation	National grant and loan programs are subject to fiscal constraints
Flood insurance	Federal government subsidized insurance for property located within flood prone areas. Local and state governments must enact and enforce comprehensive flood plain management measures.	Provides incentive to local communities to enact floodplain zoning and control construction within river and coastal floodplains	Increases housing costs
<b>PROPERTY RIGHTS</b>			
Land tenure	Government establishes or improves system for clarifying land ownership and boundaries and provides secure land tenure to occupants of illegal settlements	Landowners can gain access to formal credit sources so they can invest in improvements to withstand certain hazards	Requires political will at national level and adequate funds and expertise to introduce or improve land titling procedures  Provision of land tenure may encourage further invasion of hazard-prone areas

<b>Instrument</b>	<b>Explanation</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>LAND ACQUISITION ALTERNATIVES</b>			
<b>Voluntary sale (fee simple acquisition)</b>	Government agency purchases full title to land and all rights associated with that land for public purposes	Allows permanent protection and public access	Can be costly Removes land from the tax base Can involve high costs for management and monitoring Can be impeded by poorly functioning land markets
<b>Purchase and sellback (or leaseback)</b>	Government agencies can purchase land in fee, attach restrictions to the deed, and then resell or lease the restricted land	Retains in government ownership only those rights needed to meet land protection or other land management objectives	Cannot meet all land management objectives Requires appropriate land
<b>Expropriation</b>	Government takes private land for public purposes upon payment of just compensation	Allows government to acquire land for protecting sensitive resources if other acquisition techniques are not feasible	Effectiveness can be undermined by poor land management practices in surrounding area Requires supplementary land management program Involves high acquisition costs May involve expensive and time consuming litigation
<b>Easements</b>	Legally enforceable interests in land created by transfers	Can establish rights to enter or use land Can limit certain uses of land Avoid displacement of current residents Allow land to be retained in private ownership so the public is not burdened with operating and maintenance costs and the local government can continue to receive tax revenues	Require effective monitoring of land under easement and regular contracts with landowners to maintain cooperative relationships Restricted use may lower resale value

**Table 4. (continued)**

Instrument	Explanation	Advantages	Disadvantages
Purchase of development rights	Local and state governments purchase development rights to maintain agricultural use	Landowner can derive income from selling development rights and continue to own land	Acquisition can be costly Reduces property tax revenue
Land exchange	Government agencies may acquire land or interests in land by trading land or interests already under their jurisdiction	Provides opportunity to consolidate land holdings or acquire needed interests in land for land protection purposes without using scarce public funds	May involve substantial administrative costs (i.e., appraisals, negotiations, resource inventories, impact assessment) to accomplish complicated and time-consuming transactions  May involve political obstacles or resistance by private groups
Exaction	Required dedication of land or fee payment from private developers as a condition for obtaining zoning or building approval	New construction pays for its impact on open space	Involves difficulty in calculating land developers fair share of costs
Donation and bargain sales	Developers may donate land or are required to dedicate a percentage of their land to the public as a condition for obtaining zoning or building approval	Allow government agencies to acquire land or interests in land without using scarce public funds	Require cooperative landowners who can benefit from tax advantages (in the case of donation)
Advance land acquisition (land banking)	Strategic acquisition of limited amounts of land in advance of need so as to control its use or pattern of growth	Can restrict development in vulnerable areas  Can involve lower costs for land	Few applications are successful due largely to tendency of public agencies to become monopolistic
<b>GOVERNMENT PROVISION OF INFRASTRUCTURE</b>			
Providing basic infrastructure	Targeting resources for infrastructure provision	Can reduce vulnerability to natural hazards  Can guide development to environmentally appropriate areas	Requires ability to mobilize adequate financial resources and adequate management capacity for construction, operations, and maintenance

Instrument	Explanation	Advantages	Disadvantages
Land readjustment (land consolidation or land pooling)	A public authority assembles land for conversion, installs all public services, and finances the cost from the increase in land value from the new infrastructure	<p>Helps to remove constraints related to the development of otherwise inaccessible land parcels</p> <p>Reduces pressure on agriculture land in the urban fringe</p> <p>Allows more efficient use of infrastructure</p>	Reduces the area of landowner's property and thus is feasible only where infrastructure is difficult to obtain through other means and where demand for serviced land is strong enough to compensate the owner for the loss of land by increasing its value
<b>EDUCATION AND INFORMATION</b>			
Remote sensing	Process of recording information from sensors mounted either on aircraft or on satellites	<p>Supports all facts of disaster management</p> <p>Can supply accurate and timely information at a low cost over large areas</p>	<p>Requires specialized expertise to interpret data</p> <p>Ground verification necessary where cloud cover obstructs satellite's view of hazard (i.e., earthquakes, landslides, floods)</p>
Geographic information system (GIS)	Systematic means of combining various data about a geographic area (i.e., nation, region, city)	Provides critical data to support planning, hazard management, and environmental assessment	Requires technical skills to develop and maintain and repair system as well as commitment to update on a regular basis
Land information system (LIS)	Data base containing spatially referenced land-related data for a specific area as well as procedures and techniques for the systematic collection, updating, processing, and distribution of the data	<p>Facilitates urban planning, land administration, land management, provision of infrastructure, environmental assessment, and property taxation</p> <p>Can be self-financing</p>	<p>Requires political will at the national level</p> <p>Can involve high costs</p> <p>Requires expertise and commitment to properly interpret, update, and maintain data</p> <p>May be subject to security restrictions</p>
Coastal atlases and data banks	Systematic compilation, interpretation, and display of data linked to a specific set of coastal issues (i.e., mangrove location, land use designation, hazards), organized for an entire state or country	Facilitate integrated and informed coastal zone management	<p>May involve high costs</p> <p>Require commitment to regularly update and maintain the atlas or data bank</p>
Multiple hazard maps	Tools for analyzing vulnerability risk, especially when combined with critical facilities mapping	Supports hazards management as well as emergency preparedness planning	Requires specialized expertise

*continued on next page*

**Table 4. (continued)**

<b>Instrument</b>	<b>Explanation</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>Critical facilities maps</b>	Provide graphical references that include information on the location, capacity, and service area of facilities, which if destroyed or damaged, can impose serious costs	Supports hazard management and emergency preparedness	Requires continuous updating and specialized expertise to interpret data
<b>Natural hazard assessment</b>	Tool for determining the probable location and severity of dangerous natural phenomena and the likelihood of their occurring within a specific time period in a given area	Supports management of lands prone to specific hazards (i.e., floods, desertification, landslide, geologic hazards, hurricane)	Requires specialized expertise
<b>Vulnerability assessment</b>	Tool for estimating the degree of loss or damage that would result from the occurrence of a natural phenomenon of given severity	Supports management of hazard-prone lands	Requires specialized expertise
<b>Cultural resources inventory and registration</b>	Systematic listing of historic structures	Supports planning as well as the conservation and preservation of historic buildings, sites, and monuments	Requires specialized expertise
<b>Environmental impact assessment</b>	Tool for analyzing the potential environmental impacts of a proposed action and its alternatives prior to implementation	Can ensure that potential environmental consequences are recognized early and taken into account during project design	Requires specialized expertise and substantial cost
<b>Land market assessment</b>	Tool providing accurate and timely data based on the operation of the land market in a given urban area	Supports development planning, property taxation, and land management	Requires specialized expertise and substantial cost
<b>Advisory guidelines</b>	General directions for the project design and construction	Provides a framework for issuing permits as well as preparing land use or special area plans	Adherence to guidelines is generally voluntary
<b>Public education and participation</b>	Activities to educate the public about environmental- and hazard-related issues and to involve groups in planning and decisionmaking	Can ensure public support for and participation in management programs Provides technical support and information for improving health and environmental conditions in specific areas	Requires political commitment

**Table 5. Land management instruments: their applicability, requirements, and costs**

Instrument	Applicability					Data requirements	Administrative costs	Level of expertise
	Land degradation	Hazardous areas	Cultural resources and open space	Agricultural land	Urban sprawl			
Zoning	X	X	X	X	X	High	Low	Medium-high
Subdivision regulations	X	X	X	X		High	Low	Medium-high
Building codes		X				High	Low	Medium-high
Transferable development rights	X		X	X		High	High	High
Moratoria/interim development regulations	X					Medium	Medium	Medium
Environmental controls	X	X	X			High	High	High
Shoreline exclusion	X	X				Medium	Low	Medium
Critical area protection	X	X	X	X		High	Low	Medium
Slope-density ordinances		X				Medium	Low	Medium
Historic preservation ordinances			X			Medium-high	High	High
Permits	X	X				High	High	Medium
Mandatory policies	X	X	X	X	X	Low-high	Low-high	Low-high
Differential property assessments				X		Low	Low	Medium
Land gains taxes	X		X	X		High	Medium-high	Medium

*continued on next page*

**Table 5. (continued)**

Instrument	Applicability					Data requirements	Administrative costs	Level of expertise
	Land degradation	Hazardous areas	Cultural resources and open space	Agricultural land	Urban sprawl			
Impact and betterment fees		X				High	Medium-high	Medium
Tourism taxes and user charges	X		X			Low	High	Low
Grants and low-interest loans	X	X	X			Medium	High	Medium
Flood insurance		X				High	High	High
Land tenure	X	X	X		X	Medium-high	Medium-high	High
Voluntary sale	X		X		X	Low	Low	Low
Purchase and sellback (or leaseback)	X		X			Low	Low	Medium
Expropriation	X	X				Medium	Medium-high	High
Easements	X					Medium	Medium	Medium-high
Purchase of development rights		X	X			High	High	High
Land exchanges		X	X			High	High	High
Exaction		X				High	Low	High
Donation and bargain sales		X	X			Medium	Medium	Medium
Advance land acquisition					X	High	High	Medium

**Table 5. (continued)**

Instrument	Applicability					Data requirements	Administrative costs	Level of expertise
	Land degradation	Hazardous areas	Cultural resources and open space	Agricultural land	Urban sprawl			
Provide basic infrastructure	X	X	X		X	High	Low	High
Land readjustment	X	X			X	High	High	High
Remote sensing	X	X				High	Medium	High
GIS	X	X				High	Low-high	Medium-high
LIS	X	X	X	X	X	High	High	High
Coastal atlases/ data banks	X	X				Medium-high	Medium-high	High
Multiple hazard maps		X				Medium	Low-medium	High
Critical facilities maps		X				Low	Low-medium	Medium
Natural hazard assessment		X				High	Low	High
Vulnerability assessments		X				High	Low	High
Cultural resources inventory/ registration			X			High High	High Medium	High High
EIA	X	X	X	X	X	High	Medium	High
Land market assessments	X	X	X	X	X	High	Low-medium	Medium-high
Advisory guidelines	X	X	X			High	Medium	High
Public education and participation	X	X	X		X	Low-medium	Low-medium	Medium-high

## ANNEX A: LAND MANAGEMENT INSTRUMENTS FOR MEETING ENVIRONMENTAL OBJECTIVES

**A1.1** This annex discusses how various land management instruments can be used to address land degradation; occupation of hazard-prone land; loss of cultural resources, open space, and agricultural land; and urban sprawl. It should be noted, however, that the following provides examples of how the instruments can be applied to specific land management problems; it does not explain how each tool applies to every land management issue addressed in this paper. Further, the instruments highlighted in this annex do not constitute all of the possible options. Rather, they represent the most commonly used approaches in both developed and developing countries.

### **Regulatory Instruments**

#### ***Zoning***

**A1.2** Zoning is the most commonly used local instrument for regulating land use. It refers to the division of a municipality or other jurisdiction into districts (or zones) in which certain uses (that is, residential, commercial, industrial) are permitted and others are not. Zoning also establishes the height of buildings and other structures; minimum allowable lot sizes; minimum setback from the street or property lines; and allowable density of development. By controlling urban land uses and densities, zoning can protect critical environmental areas such as wetlands, restrict development in hazard-prone areas, and separate conflicting land uses. Zoning, which is one of the community's "police powers," is probably the most powerful local instrument because it permits the community to exclude many uses altogether.

**A1.3** Zoning ordinances consist of text and a zoning map. The text describes the permitted uses in the various districts, establishes standards for uses within those districts, and provides for administration and enforcement. Changes to a zoning ordinance text or map is accomplished through an amendment process initiated by either the local government, a landowner, or by local residents. The following are specific types of zoning that are particularly relevant to managing sensitive lands and cultural resources.

- **Large lot residential zoning.** Large lot zoning or minimum lot size zoning requires lots in a residential zone to be of a certain size so as to reduce the density of residential development. Although the environmental and economic effects of large lot zoning vary with the specific situation, in some cases, it can effectively reduce the negative impacts of development on sensitive landscapes or natural resources. To work effectively, large lot zoning usually must be used in combination with regulations that accommodate market demand in other more suitable areas. In practice, however, these regulations may temporarily discourage subdivision development, but exacerbate urban sprawl and inefficient subdivisions that consume unnecessarily large amounts of agricultural land. Moreover, large lot zoning can be criticized for excluding the poor and discouraging in-migration of newcomers.

- **Exclusive agricultural zoning.** Agricultural zoning is intended to preserve agriculture as a permanent land use by limiting the intrusion of non-agricultural uses and requiring large minimum lot sizes. In the United States, for example, some districts require minimum lot sizes of as much as 160 acres. Exclusive agricultural use ordinances prohibit non-farm dwellings, with “farm” defined in economic or other performance terms (i.e., a minimum annual gross agricultural income threshold). According to Mekvichai et al. (1991), however, there is no evidence of any country that has successfully limited land conversion without creating serious inflationary pressure on land prices for other uses. For example, Japan has artificially preserved agricultural land; this has resulted in the inflation of rice prices to seven times the world market price and inflated the cost of residential housing to the highest in the world. The factors leading to the growing competition for land and the resulting pressure for land conversion are all closely linked to growth in the economy and to each other. The growing competition for land in Japan is a direct consequence of the expanding economy’s search for additional land at reasonably low prices. Because competition for land has led to increased land prices, an increasingly powerful incentive to sell has been created. According to recent studies by the Land Institute of Thailand and PADCO, the lowest land price in the housing projects in five provinces has now reached two million baht per rai, which is far higher than the income potentially derived from agricultural products used in the area. Thus, selling land is much more attractive than renting it out for agriculture or farming by oneself. Moreover, there is an incentive for tenant farmers to leave low wage farming for higher paying jobs in industry or service sectors.
- **Floodplain zoning.** Floodplain zoning regulations control uses of land within hydrologically defined areas subject to floods of a designated frequency.<sup>1</sup> Essentially, they establish a flood set-back rule for most development. In the United States, the impetus for most local floodplain zoning ordinances was the National Flood Insurance Program and the ordinances are consistent with its regulations. Because many non-tidal wetlands are found in floodplains, some local floodplain ordinances incorporate provisions or policies that afford nontidal wetlands some degree of protection. For example, Talbot County, Maryland, amended a floodplain management ordinance (originally based on a model ordinance drafted by the Federal Emergency Management Agency as a requirement for participation in the National Flood Insurance Program) to include “wetlands floodplain” (those portions of land within the Floodplain District subject to inundation by the 100-year flood and determined to support wetlands as defined in this ordinance) within the floodplain district (Burke et al. 1988).
- **Wetland zoning.** Wetland zoning regulations typically limit permissible uses to those that do not entail significant surface disturbance or runoff. The most common form of wetlands zoning identifies wetland areas and substantially restricts land-disturbing uses within these areas as well as its surrounding areas

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1. Floodplain regulations are included in comprehensive zoning ordinances, subdivision regulations, or as part of building review processes. Others are developed as separate ordinances.

(for example, within 40 or 50 feet of the wetland boundary. Where wetlands zoning is applied, the zoning regulations often establish a buffer zone with permissible uses within this buffer zone severely restricted. These buffer zones help to insulate wetlands as well as water quality from any adverse impacts from surrounding activities (Mantell et al. 1990).

- **Historic area zoning.** Historic area zoning is intended to preserve the integrity of an area as well as individual structures. Historic zoning regulations include permissible uses, densities, and development standards. In historic districts, there can be stringent controls on building exteriors and surrounding spaces with more flexible limitations on the uses of buildings so as to allow adaptive reuse. In Guatemala, for example, the government designated Antigua as an historic district and established height limitations, advertising controls, and other regulations on building materials, lighting, and new additions. Despite numerous violations, the city has managed to maintain its historic character. The success of the Antigua experience is due largely to the application of a workable system of permits and building inspections as well as the availability of local expertise to assist owners of historic buildings in meeting their requirements (Taboroff 1991).
- **Cluster zoning (or planned unit development).** Cluster zoning allows flexible design and clustering of residential development in higher densities on the most appropriate portion of a land parcel so as to allow agricultural development or to provide increased open space elsewhere on the parcel. Although the density may remain the same, it is concentrated on one portion of the tract. Cluster zoning can limit development in and adjacent to environmentally sensitive or hazard prone areas, reduce the amount of open land disturbed by development, and reduce the amount of roads and utility lines needed for new development and therefore reduce the cost of housing and public services. Cluster zoning also can be used to protect certain cultural resources, but it is not the principal land use tool to accomplish this objective.
- **Performance zoning.** Performance zoning allows flexibility in design as long as certain standards are met. Proposed uses whose impacts would exceed specified standards would be prohibited. This type of zoning can be applied to residential development and industrial zones as well as to historic properties and environmentally sensitive areas such as wetlands (*see* Box 9). To protect historic properties, for example, a locality could require a developer to conduct a site-specific historic survey, and if important resources are identified, to avoid or mitigate the negative impacts of the project on historic resources. To control development on hillsides, performance standards can specify the density of permitted development based on factors such as slope stability and the levels of erosion and sedimentation that would result from specific development. Typically, performance standards are expressed as ratios of open space, density, and floor area. As long as the standards are met, development can be clustered in one or more areas of the tract, leaving other areas in natural cover. Their effective-

### Box 9. Performance standards for wetlands

Sanibel, Florida has an innovative ordinance that was one of the first to define specific performance standards for protecting wetlands. Among many other criteria, the following were included in the ordinance:

- Fill shall not be placed within 20 feet of an open body of water.
- Slopes resulting from the placement of fill shall be no steeper than a three to one (horizontal to vertical) ratio and must be stabilized with vegetation to prevent erosion and sedimentation. The stabilization must be completed at least 30 days prior to the issuance of a certificate or occupancy permit. The vegetation used for fill stabilization must be maintained in a living condition for the life of the development.
- Disturbance of native vegetation shall be limited to the minimum necessary for each building site or development activity.
- Wastewater, fertilizers, pesticides, other potential pollutants, and sediments must be prevented from entering directly, via surface-water and ground-water flow or outfall structures into lakes, canals, and open bodies of water.
- Filling shall consist of only the minimum amount necessary to achieve the permitted purpose.
- Where vehicle and driveway access is permitted, the hydrological connection will not be disrupted.
- When the use of fill is permitted, it shall be clean and not garbage refuse, toxic or contaminated material, or any extra material that through the action of soil leaching may cause the degradation of surface or ground-water quality.
- During development, every precaution shall be taken to prevent the disruption of adjacent wetlands and open bodies of water. During construction, turbidity screens and any other best management practices shall be used at all times to minimize siltation, sedimentation, and erosion.
- To ensure that sediment remains on the site and is not transported into other wetlands or into open bodies of water, erosion and sediment controls shall be left in place until filled areas are stabilized with permanent vegetation that will prevent the transport of sediment off the site.

Source: Burke et al. (1988)

ness depends primarily on the quality and thoroughness of the standards themselves and how well they are tailored to local conditions (Mantell et al. 1990).

- **Overlay zoning.** Overlay zoning involves the imposition of special regulations and standards to a designated area that may cut across several different pre-existing conventional zoning districts. These regulations and standards would apply in addition to those of the underlying zoning district. To protect wetlands, for example, a conservation overlay district can specify minimal protection for various types of wetlands. In North Carolina, for example, New Hanover County's conservation overlay district establishes the amount of wetland area that can be developed based on specific types of wetlands. If a parcel contains a swamp forest of at least 2.5 acres, at least half of the area cannot be developed. Other types of wetlands are assigned "conservation space factors" (that is, the amount of undevelopable area on a particular parcel). For example, a fresh marsh area with a minimum area of one acre has a conservation space factor of .8 and a natural pond must be completely preserved (conservation factor of 1.0) (Burke et al. 1988). An overlay flood zone may impose additional construction

### Box 10. Green area preservation in Seoul

Twenty years ago, the government of Korea established a Green Belt around the Seoul capital region. Its purposes are to prevent urban sprawl; preserve ample space for future uses (i.e., environmental protection, preservation of lands for recreational and cultural facilities, protection of water supply sources); and to contribute to national defense. The Green Belt encompasses 5,397.1 square kilometers covering 34 cities and 36 counties of 14 major urban areas. It occupies 5.4 percent of the total national land compared to only 5 percent of the total national land consumed for urban uses. Although this control has been considered to be effective, its continued application poses several problems.

When the Green Belt was designated, the areas 100 meters above sea level were uniformly selected, with many places awkwardly designated. In some extreme cases, the designation boundary line passes through houses and buildings without any changes during the past 20 years. In addition, there are 3,346 small towns and villages where the residents cannot fully exercise their property rights. In these areas, there have been protests from 1.24 million residents, refusal to issue new building permits, and overall control without any consideration of the present situation. Other problems associated with the Green Belt are chronic congestion and high land prices in the capital region.

To encourage industries and their employees to move into the small cities, it has been recommended to decontrol some of the Green Belt area. The most thorny issue regarding the partial changes or readjustments of the Green Belt is the possibility of speculation caused by the huge amount of windfalls expected. Large companies already are believed to have bought up a large share of the Green Belt waiting for the time of decontrol. One possible solution would be to tax away capital gains generated by lifting the control. The tax rate would be heavier for the absentee owners and less for the residents of the area.

Source: Yoo (1991)

and flood-proofing requirements. Overlay historic districts can permit the existing uses and densities in the underlying zone, but require structures within the historic district to be built or maintained so as to ensure historic compatibility (Mantell et al. 1990).

- **Open space zoning.** Open space zoning is used to preserve designated land areas for a variety of reasons (i.e., preventing urban sprawl, preserving recreational areas, preserving ample space for future uses). A well-known example of open space zoning is the green belt that surrounds the Seoul capital region in Korea (*see* Box 10).

**A1.4** In developing countries, land use controls have the best chance for success where the areas to be restricted are relatively small, the problems are clearly identified, the public is supportive, and there is adequate enforcement capacity. Generally, zoning has not been effective in achieving large-scale shifts in development patterns or in changing aggregate supply or demand. Unless zoning is built on a strong foundation reinforced with supplementary control measures and is fully consistent with major market forces, it cannot provide an effective control program (Mekvichai 1991). Moreover, where land use controls significantly limit the location and supply of residential land, it becomes a major source of inflation in housing costs.

**A1.5** In controlling land use in environmentally sensitive areas, urban land managers must consider the availability of alternative building sites, location of existing roads and water/wastewater disposal systems, land values, and development pressures. As discussed earlier, if land will be

restricted, there must be alternative sites or increases in allowable densities in other sites located near employment centers or where there is adequate public transport. In Bogota, Colombia, there is a greenbelt ordinance, but land prices have not been increasing as fast as Seoul's partly because Bogota's residential building densities have been increasing, particularly in middle-income and upper-income areas. Unless developers can offset rising land prices by increasing density or some other means, households are not formed or they will crowd together. In some cities, households shift to the more affordable informal sector, where by ignoring government rules, densities can be increased and housing costs lowered (Dowall and Clark 1991).

A1.6 Zoning can be effective, but has negative consequences as well. It prevents landowners, developers, and households from acting freely in the land they control and requires a sophisticated well-trained bureaucracy with a strong enforcement arm to operate effectively. Moreover, local officials in developing countries rarely use zoning effectively. Few can afford the elaborate system of inspectors, officials with police powers, and judicial bodies to resolve disputes to make these controls work effectively (Kitay 1985).

### ***Subdivision regulations***

A1.7 Subdivision regulations are locally adopted laws governing the process of converting raw land into building sites. They control the physical layout of new development by establishing standards such as lot size, width and length of streets and sites, and adequate space for public facilities and services (that is, traffic, utilities, recreation, installation of water and sanitation services). Subdivision regulations are accomplished through plat approval procedures; a developer is not permitted to make improvements or divide or sell his or her land until the plat (map) of the proposed subdivision is approved by the planning authority.

A1.8 To manage hazardous areas, subdivision regulations can prohibit the subdivision of land subject to flooding or other hazards unless such hazards are overcome by special construction techniques. Subdivision regulations also can be used to protect sensitive environmental areas as well as cultural resources. For example, communities can protect wetlands by imposing limitations on the use of septic tanks in or near poorly drained soils or by requiring open space dedications to buffer wetland areas. To encourage the preservation of historic districts and culturally significant landscapes, communities have enacted waivers and special standards to encourage or require lot arrangement, street design and materials, sidewalk design and materials, and other development standards that are compatible with the protection of local heritage (Mantell et al. 1990).

A1.9 Subdivision regulations are used extensively in developing countries. Planning authorities may require a substantial portion of a private developer's land for open spaces and other public purposes. The costs of land regulations to households include the direct costs to meet minimum standards, costs in time and manpower to obtain the necessary titles and permits, and informal payment costs where laws are imprecise. All of these costs, however, fall mainly on the poor. Minimum plot size increases the costs to households that would normally choose a smaller plot size than that mandated by the regulations.

### ***Building codes***

A1.10 Building codes are one of the oldest and most commonly used methods of controlling land development. They control the materials used for constructing new buildings as well as the

manner in which they are constructed. They address fire protection, structural safety, resistance to natural disasters, sanitation, and aesthetic considerations. They also can include restrictions against the erection of any structure based on the style of architecture, the cost of the structure, the materials, the position of the building on the lot or its distance from the street, its height or depth, and the use to which the building shall be put. Building regulations must be codified or written into deeds or other instruments and may be statutory or contractual.

A1.11 In the case of natural hazards (i.e., floods, tropical cyclones, earthquakes), building codes can be an important means of controlling losses. To ensure that structures in a hazardous area can withstand a hazard of a specified magnitude, building and housing codes can establish minimum floor elevations, prohibit or restrict the use of inferior building materials, and require proper anchorage or foundation stabilization. Although the incorporation of standards to withstand hazard induced stress into building regulations is usually considered to augment construction costs, simple precautions can be effective. For example, anchoring roofs securely to buildings or installing strong shutters for glass windows can reduce damage from tropical cyclones considerably.

A1.12 In Latin America, the use of building codes for mitigating natural disasters seems to be growing, notably in the Caribbean where the adoption of building techniques and codes that can reduce damage to buildings from tropical cyclones and other natural disasters is promoted by the PCDDP. In 1982, for example, the Caribbean Community Secretariat, with assistance from various other organizations, embarked on the development of a Caribbean Uniform Building Code intended to reduce damages from tropical cyclones (ECLAC 1990). After the 1985 earthquake, the government of Mexico ordered the rapid updating of building codes in all 32 states in accordance with the latest results of engineering research in Mexico and abroad. Within one month after the earthquake, an emergency building code was adopted for Mexico City (Jakob 1989).

A1.13 Notwithstanding their effectiveness in reducing vulnerability, the imposition of building codes often has been responsible for raising housing costs. Every regulation that raises costs, unless compensated by an increase in real income or subsidies, reduces the segment of the population that can afford to purchase a house. In many developing countries, land use regulations and building standards constrain low-income groups' access to land. While these regulations attempt to ensure citizen health, safety, and welfare, they force the very groups they seek to protect into the completely unregulated informal sector. The solution, therefore, is to design building standards as well as subdivision regulations that address both externalities and housing affordability concerns simultaneously (Dowall and Clark 1991).

### ***Transferable development rights***

A1.14 The concept of transferable development rights (TDRs) treats development potential as a good that can be sold or traded by allowing transfers of density between tracts of land that may be under different ownership. A TDR program works through zoning regulations that limit the height or intensity of development in one area and allow increased height or density in another area. In designing TDR programs, certain areas are designated as conservation or "sending" areas where development is to be limited. Other areas suitable for more intense development are designated as transfer zones or "receiving" areas. Within the receiving area, there is a certain density of development allowed. This density, however, may be exceeded if the owner purchases a specified number of development rights from the "sending" area. A landowner in the sending area can sell a specified number of rights based on the amount of land owned. Once sold, the right to develop is removed from the property.

A1.15 TDRs can be used to protect historic properties and agricultural land. For example, an historic building's height and bulk may be much less than allowed by current zoning ordinances. Economic forces to use the full potential of the land may lead to the demolition of the structure to make way for a high-rise office or residential building. A TDR would allow the owner of the historic property to sell rights to the maximum density. The owner of a lot in a designated receiving area could purchase these rights and receive an increase in the allowable height or bulk of construction. Similarly, an owner of a 100-acre farm may have rights to develop 50 two-acre lots. An owner of another 50-acre parcel closer to the city and already serviced by public water and sewer might have the right to develop 50 one-acre lots. A TDR program would allow the owner of the farm to sell his right to develop 50 units to the owner of the smaller parcel closer to the urban area. By purchasing these rights, 100 units on half-acre lots could be built on the 50-acre tract. The market would determine the value of the development rights (U.S. Department of the Interior 1982).

A1.16 In the developing world, the second Bombay Development Plan allows land owners whose lots are designated to be used for public recreation or other public purposes to offer these sites to public authorities without charge while they retain the sites' development potential, which the owners can either use on other sites or sell to developers (D'Souza 1993). In most developing country cities, however, TDR programs may have limited applications because they are very complex to implement and can only work where there is effective zoning enforcement. Substantial efforts to plan, educate property owners, and overcome political sensitivities also are needed. When considering a local TDR program, other factors also must be taken into account: the program should be structured so that it is easily understood by all actors in the land market; provides strong incentives to owners of agricultural land or historic buildings to sell TDRs rather than develop or sell the land at the permitted densities; and provides adequate incentives for developers to buy TDRs (Mantell et al. 1990).

### *Moratoria and interim development regulations*

A1.17 Development moratoria and interim regulations are designed to substantially restrict development for a limited time period. They can impose a complete temporary ban on all development or on specific types of intensive development. A moratorium can apply to zoning approvals, subdivision approvals, and building permits. Restrictive interim regulations generally relate to one of two permissible goals. Either they must restrain development until a plan can be developed or a permanent growth management program implemented, or protect public safety, health, or the environment by preventing potentially hazardous overburdening of public facilities. The duration of a moratorium should be specified when enacted and should be tied to the time period necessary to develop a plan, implement a growth management program, or upgrade public facilities related to the relevant safety or environmental problem (Mantell et al. 1990).

### *Environmental controls*

A1.18 National, state, and/or local pollution and waste management controls can restrict the discharge of air and water pollutants as well as solid and hazardous wastes into the environment. When properly designed and enforced, these controls can protect sensitive lands as well as urban populations located on lands in close proximity to industrial facilities. Urban waste management and pollution controls also are needed to protect urban populations from health hazards associated with poor air and water quality. Although these controls are not necessarily land management instruments

**Table 6. Shoreland exclusion or restriction setbacks**

Countries	Distance inland from shoreline
Ecuador	8 m.
Hawaii	40 ft.
Philippines	20 m.
Mexico	20 m.
Brazil	33 m.
New Zealand	66 ft.
Colombia	50 m.
Costa Rica	50 m. (public zone)
Costa Rica	200 m (restricted zone)
Indonesia	50 m. (forest cutting)
Indonesia	400 m. (mangrove greenbelt)
Venezuela	50 m.
Chile	80 m.
France	100 m.
Norway (no building)	100 m.
Sweden (no building)	100 m. (in some places 300 m.)
Uruguay	250 m.
Greece	500 m.
Denmark	1-3 km.

Source: Sorensen and McCreary (1990)

per se, they often involve land managers at different levels of government to address such issues as location of heavy industry or energy facilities; use of land for mineral extraction or processing; air quality degradation associated with automobile congestion; and the dredging and filling of wetlands.<sup>2</sup> The main advantage of these tools is that they can provide direct protection of sensitive environmental resources and urban populations. Their effectiveness, however, depends on government capacity and willingness to design, implement, and enforce locally appropriate controls.

### ***Shoreline exclusion or restrictions***

A1.19 Shoreline exclusion or restrictions refers to regulations that prohibit or substantially limit certain uses within a strip or band in the coastal zone. The areas subject to shoreline restriction are typically landward of the high water mark; they are rarely the intertidal zone or submerged lands because national governments usually control these areas under separate mandates. In developing countries, the shoreline exclusion strategy commonly arises from three concerns: blockage of public access, degradation of views, and erosion of shorelines. Residential development and tourist

2. For a more detailed discussion of urban waste management and pollution control, see two other publications by the author, *Alternative Approaches to Pollution Control and Waste Management: Regulatory and Economic Instruments* (Urban Management Program Discussion Paper, Number 3, 1991) and *Priorities for Urban Waste Management and Pollution Control* (forthcoming Urban Management Discussion Paper).

**Box 11. Shoreline restriction in Costa Rica**

The jurisdictional area of Costa Rica's shoreline restriction is a 200-meter-wide marine and terrestrial zone. The law divides the zone into two components: the "zona publica" and the "zona restringida" (restricted zone). The zona publica extends inland 50 meters from mean high tide or the inland limit of the wetlands and the upstream limit of the estuaries as defined by salt or tidal influence. The zona restringida covers the remaining 150 meters inland. The zona publica is devoted to public use and access, and commercial development is generally prohibited. Exceptions to the prohibition against commercial development are made for enterprises that are coastal dependent, such as sport fishing installations, port installations, and their infrastructure. In the zona restringida, development is controlled by a permit and concessions system that is based on a detailed regulation plan formulated at the local level of government. A concession is a development right on a specific parcel of land for a particular land use and fixed time period.

*Source:* Sorensen and McCreary (1990)

development appear to be the primary targets of shoreline exclusion. In some cases, exclusion zones and land use planning boundaries for permit letting are mutually supportive and may be integrated into a single program. Shoreline exclusion zones differ from critical area programs in that they are coast-wide and do not carry a special designation declaring the uniqueness of particular types of areas (Sorensen and McCreary 1990).

A1.20 Many countries have adopted the concept of public ownership along the shoreline (*see* Table 6). In Latin America, at least eight countries apply the concept of a zona publica (public zone). Among them, there is considerable variation in the width of the zona publica as well as differences in both the uses that are allowed and the extent to which the government carries out planning and management in the area. According to Sorensen and McCreary (1990), Costa Rica (*see* Box 11) appears to have the most ambitious and comprehensive shoreland restriction program in the world.

A1.21 Shoreline exclusion or restriction programs are administratively attractive in that they are inexpensive, geographically precise, and offer clear guidance about prohibited uses. This administrative simplicity provides a high degree of certainty for both coastal management agencies and potential developers. Such zones can be tailored to particular natural resource features such as dunes, mangroves, or other wetland habitats, to ensure that they are protected wherever they occur in the coastal zone. Exclusion programs providing a setback for public access and shoreline recreation are likely to enjoy wide support from inland residents who do not own property. In a situation where coastal resources are being degraded at a rapid rate, exclusion or restriction zones can be an effective way to impose a moratorium on development until a more comprehensive land use plan can be prepared and implemented (Sorensen and McCreary 1990).

A1.22 Highly developed or urbanized coasts present difficult or impossible circumstances for the use of exclusion zones. Imposition of an exclusion zone would be opposed in political circumstances where local property owners have enjoyed a high degree of discretion in implementing their own development plans. Similarly, it is doubtful that exclusion programs could be adopted without strong support from a nation's legislative body or chief executive. Moreover, exclusion programs require complementary programs of land use planning or some other effective planning strategy. Exclusion programs alone are not sufficient to achieve effective integrated coastal zone management.

### ***Critical area protection***

A1.23 Critical area protection programs are enacted by state or national governments to achieve one or more of the following purposes: to conserve or preserve a particular type of sensitive environment or natural area (i.e., wetlands, coral reefs, endangered species habitats); to preclude development on selected eroding coasts; or to restrict development in a special flood plain. Critical area protection programs differ from other management strategies such as shoreline exclusion in that they require a formal designation, they apply to specific geographic locations (not coast-wide, for example), and typically address the concerns of more than one sector (for example, wildlife protection, hazard area management, parks, research). The strategy of critical area designations often represents a precursor to the establishment of hazard control zones, wildlife refuges, or parks. They also may precede a shoreland exclusion strategy (Sorensen and McCreary 1990).

A1.24 A commonly used technique to implement a critical area program is to severely restrict development, usually in perpetuity. The mechanisms to ensure that no development occurs may include some form of purchase, ministerial restriction, or condemnation. In some cases, “buffer zones” surrounding a core resource area are incorporated into a critical area program. Under Indonesia’s National Forestry Act, for example, a 50-meter-wide belt of “protection forest” must be maintained along coastlines for mangrove silviculture and a 20-meter-wide belt must be kept intact along river banks. In other cases, a critical area program requires an environmental assessment to precede any project in or adjacent to the critical area.

A1.25 Critical area management can be used by developing countries to avoid the consequences of urbanization in flood plains. It enables government agencies to concentrate funds and staff resources on the most threatened or hazard-prone areas. Because many designated areas support more than one important resource or hazard, the critical area strategy provides the flexibility to tailor a detailed site plan or management approach to unique local conditions. Like land acquisition, however, critical area designation is seldom a complete response to a resource issue. Nonetheless, it is likely to be a more comprehensive approach than using acquisition alone because critical area protection usually contains both a land use regulatory program and rules for guiding human activities within the area. A critical area designation, however, could become the focus of intense political controversy (Sorensen and McCreary 1990).

### ***Slope-density ordinances***

A1.26 Slope-density ordinances address the increased environmental and public safety risk associated with development on steep slopes. They specify the percentage of a parcel that may be developed or the permitted density based on the overall slope of the parcel. The minimum lot size may vary according to its average slope. The precise slope-to-density formula should be based on the following local factors: geological and soils condition, such as slope stability; steepness of the slopes; suitability of the site for on-site water supply and wastewater treatment, or the availability of public water and sewer; amount and nature of roads required to provide access; and the type and amount of vegetative cover.

### ***Historic preservation ordinances***

A1.27 Historic preservation ordinances establish a process for designating historic properties and districts and for the review of alterations to, and the demolition of, designated historic properties.

In designated districts, these ordinances establish procedures and standards to ensure that alterations and new construction are compatible with the historic character of the district. In Pakistan, there is a variety of legislation relevant to historic properties in Lahore. For example, the Lahore Development Act of 1975 allows the Lahore Development Authority to declare a controlled area to regulate building activity. The Punjab Special Premises Ordinance of 1985 allows any premises to be declared government property if it is of public value (including historic or cultural value) and requires compensation to the owner. This ordinance applies specifically to the protection of 19th and early 20th century buildings in Lahore (Taboroff 1992). In China, the Beijing Government issued a decree banning the construction of skyscrapers in the city center because they threaten the city's style as well as historic and cultural features. The government also imposed height restrictions on new buildings located near ancient building and streets. For example, buildings over three to five stories cannot be constructed near the Forbidden City, Imperial Academy, and Jinshan Park. The success of these measures has encouraged other similar decrees throughout the country (Wen 1989).

A1.28 Local historic preservation ordinances will vary by location according to enabling legislation. In drafting effective local preservation ordinances, however, the following issues should be addressed: statement of purpose, creation of an historic preservation commission; delegation of powers and authorities; criteria and procedures for designating historic districts and landmarks; activities that require review by commission and a certificate of appropriateness; criteria and procedures for review of applications for a demolition permit and procedures to delay demolition; jurisdiction over publicly owned property and governmental actions; maintenance of historic properties; appeals from commission decisions; and enforcement and penalties (Mantell 1990).

### *Permits*

A1.29 Permitting is an integral component of numerous types of land and environmental management strategies. Land use planning, shoreland exclusion, critical area protection, and environmental impact assessment are all undertaken to provide government units with policies and/or information for making decisions on the issuance of permits that are required (usually by law) before proposed development actions can proceed to construction or implementation. For example, local governments can use conditional permit approvals to require developers to minimize or compensate for the negative impacts of projects on wetlands, coastal zones, or cultural resources. Sri Lanka requires a permit for all development activities (that is, any activity likely to alter the physical nature of the coastal zone in any way and includes the construction of buildings and works, the deposit of wastes or other materials from outfalls, vessels or by other means, the removal of sand, coral, shells, natural vegetation, seagrass or other substances, dredging and filling, land reclamation and mining, or drilling for minerals) within a 300-meter coastal zone (Lowry 1989).

A1.30 The main advantage of permit systems is that they allow a management agency to discourage undesirable projects before they are submitted for approval and to attach conditions to other proposed uses or activities that will reduce or mitigate potential adverse effects. Measures to mitigate impacts on sensitive resources include avoiding impacts altogether by not taking a certain action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, restoring, or rehabilitating the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and compensating for the impact by replacing or providing substitute resources or environ-

ments. In the case of wetland protection, wetland mitigation banks are a relatively new technique that allows developers to get credits for restoring wetlands and to trade them in exchange for the right to fill in other wetlands.

A1.31 Permits are useful to the extent that they can be granted or withheld according to how the entity meets certain conditions. Nonetheless, in many countries, the government unit that carries out the management strategy does not necessarily have permitting authority to ensure that its decisions are adequately implemented. The effectiveness of a management strategy, therefore, is greatly increased if the governmental unit also has permitting authority to back up its decisions (Sorensen and McCreary 1990).

### ***Mandatory policies***

A1.32 Mandatory policies are used by government units that have the power to issue permits and prepare specific land use plans. They are formulated to provide a framework for issuing permits as well as for preparing land use or special area plans. Generally, they are organized according to types of uses, environments, or resources. For example, the Sri Lanka Coastal Zone Management Plan produced in 1987 consists of policies organized into three groups: types of environments (i.e., estuaries, corals, mangroves, dunes); types of resources (i.e., archaeological, historical, scenic sites); and administrative procedures. Although policies may cover every scale and type of coastal development and conservation, they are not land use or special area plans. Rather, mandatory policies tend to be vague as to how land and resources in specific geographical locations will be affected (Sorensen and McCreary 1990).

### **Economic Instruments**

#### ***Differential property assessment***

A1.33 Differential property assessment can be used to protect sensitive lands and cultural resources as well as to reduce land holding and speculation. To preserve agricultural land, for example, there are four types of differential taxation programs: straight preferential or use-value assessment which assesses farmland (or other open lands) based on its current rather than its market value; deferred taxation programs that combine use-value assessment with a "rollback tax" or recapture provision to recoup some or all of the tax benefits in the event that the farmland is developed; restrictive agreement programs that work in a similar way to a preferential assessment program with a recapture provision, but involve contractual agreements between the state and the landowner; and programs that relieve property taxes once they reach a certain threshold level.

A1.34 Based on the literature reviewed, there is no evidence of preferential taxation systems used to preserve agricultural land in developing countries. In the United States, however, differential property taxation programs have been only marginally effective. They provide a significant tax benefit only when the market value of a farm parcel is significantly greater than the use value of the agricultural land (that is, areas under heavy development pressure). In such areas, however, the financial advantages of selling out for development are so great that even tax benefits and the threat of a recapture provision frequently do not prevent land conversion. Where development pressures are insignificant, differential taxation is inefficient or ineffective; providing tax benefits to landowners when there is little or no pressure to develop the land reduces the local tax base with little protective effect (Mantell et al. 1990).

**A1.35** Property tax benefits can encourage historic preservation in several ways: by reducing the incentive for a landowner to demolish in order to reduce the property tax burden of an empty or under-utilized building; reducing property taxes to reflect decreased property values resulting from historic preservation regulations or preservation easements; and by encouraging renovation and reuse in return for tax concessions. For example, a municipality can assess historic properties at their current use value rather than market value or provide a property tax exemption of a certain percentage of the assessed value of an historic structure as well as the associated land. In the United States, North Carolina provides the owners of locally designated historic properties with a 50 percent reduction in assessed valuation. In the event that such a designation is lost or there is a destruction of the property's key historic features, the state recoups the tax benefits with interest. In Oregon, owners of properties listed on the National Register are eligible for a 15-year freeze on assessed valuation. The properties, however, must be open to the public once a year and maintained according to specified standards (Mantell et al. 1990).

**A1.36** Property tax measures also can encourage the sale and development of existing stocks of vacant land and discourage future speculative dealings in land. In Korea, for example, the government authorized strong property tax measures to change the property tax base, increase property tax collections, stabilize land prices by countering land speculation, and make hoarded land available for housing development (*see* Box 12). In Latin America and Asia, a tax on vacant land has been applied in some cities, but the results have not demonstrated that this technique produces the desired response. Moreover, using the property tax to counter land speculation or to encourage resource protection requires effective land registration systems and well-administered and enforced property tax systems. In developing countries, however, where these conditions rarely exist, the application of property tax instruments to meet environmental objectives are likely to be ineffective.

### ***Land gains taxes***

**A1.37** Land gain taxes are a type of capital gains tax applied to increases in land value between the time of initial purchase and subsequent sale or exchange of land. They can be used to slow development of agricultural lands or open space in the interests of resource protection. In addition, revenues derived from this tax may be used to purchase sensitive lands or interests in lands in other areas requiring protection. Political factors, however, can make land gains tax programs difficult to administer effectively regardless of their intent (U.S. Department of the Interior 1982). Moreover, land gains taxes can inflate property values. In developing countries, heavy capital gains have been levied to discourage speculation, but they have not proven to be effective (Kitay 1985).

### ***Impact and betterment fees***

**A1.38** Impact fees or betterment fees are required one-time payments by developers, builders, or industry at the time of development approval to finance various public facilities. They usually are calculated to be proportionate to the cost of providing the physical infrastructure and environmental services needed to increase the carrying capacity of the land sufficiently to accommodate new development while protecting the environment. Impact fees can be used for flood protection, parks and recreation, roads, water supply and sanitation, and environmental monitoring and auditing as well as to finance hazardous waste cleanup. They differ from requirements specified in subdivision regulations in that the facilities they finance are mostly off-site and benefit the general public. By contrast, the improvements required by subdivision regulations normally are located on-site and benefit the residents of the new development.

**Box 12. Tax measures to discourage land speculation in Korea**

In 1989 in the Republic of Korea, the government passed into law three land policy bills to stabilize land prices by discouraging land speculation, to make hoarded land available for housing, and to increase property tax revenues. One of the bills provides for the existing property tax to be replaced with a yearly "comprehensive land value tax" to be levied at a progressive rate (from 0.2 percent to 5.0 percent) on the total assessed value of each taxpayer's landholdings. This assessed value will be on the market value of the landholdings instead of the then present 10 to 30 percent of market value.

In the case of individual households, the legislation sets an ownership limit of 660 square meters of residential land holdings in Seoul and five other Korean cities and a limit of 990 square meters in the next six largest cities. Landholdings larger than this will be taxed at three to six percent per year, after a grace period of two years (from January 1990), to allow owners time to sell their excess land. Companies and individuals that hold urban and rural land in excess of their business requirements will be subject to a capital gains tax payable every three years (and when the land is sold) that will be calculated at 50 percent of the increase in its estimated market value in excess of the national average rate of land value increase.

According to Archer (1990), the collection of a capital gains tax on idle urban land every third year is an innovative approach that should encourage the early sale of the land in two ways: 1) by reducing the owners expected speculative profit after tax; and 2) by requiring a significant penalty tax payment every third year in addition to the annual property tax payments. Capital gains taxes, however, are normally collected when the asset is sold because that is when the taxpayer normally has the money available. This after-sale tax obligation, therefore, operates to discourage the sale of assets and can increase land hoarding.

*Source: Archer (1990)*

A1.39 In Martin County, Florida, for example, a Beach Impact Fee Ordinance requires developers to contribute to a fund, based on the projected recreational demand resulting from the proposed development, to purchase and maintain beachfront property. San Diego, California finances capital facilities for suburban development through "flexible benefits assessments," which combine impact fees and special assessments (that is, a local taxation technique by which all or part of the cost of a facility is charged to a landowner who derives benefit from the improvements) which finance among other things, parks, roads, libraries, schools, utilities, drainage systems, transit service, and police and fire protection (Mantell et al. 1990).

A1.40 The advantage of impact fees is that private developers will be responsible for paying for the impacts of new construction on open space, hazard-prone land, or other sensitive lands. Nonetheless, the developer can shift these costs to the housing consumer. Moreover, these taxes can not necessarily prevent development on or adjacent to environmentally fragile lands. Political factors also can make land gains tax programs extremely difficult to administer regardless of their intent.

***Tourism taxes and user charges***

A1.41 Tourism taxes or user fees can be used for raising funds for conservation and protection of natural and cultural resources. For example, taxes can be assessed on transport (airport taxes, ferry boat taxes), hotels, restaurants, or other facilities such as marinas. The willingness of tourists to pay, however, is not certain. Consequently, most Mediterranean countries, for example, are reluctant to levy taxes on tourists for fear of losing their place in the very competitive European market. A regional approach, therefore, would be needed to ensure the effectiveness of tourism taxes in the protection of cultural resources (Taboroff 1990).

A1.42 User charges can be applied to historic sites where foreign tourists are charged a higher price than local visitors, as practiced in Tunisia and Egypt. Revenues from activities associated with the use of historic facilities; rents from cafes, restaurants, and shops in historic properties; and movie rights also can be added to the funds available for conservation. For sites with large numbers of visitors, user fees can provide for self-financing of maintenance and investment in site protection and presentation (Taboroff 1990). In some cases, taxes on cigarettes, sales, gasoline, and natural resources as well as revenue from fees and licenses can be used for the purchase of sensitive lands or open space for recreational use. These revenues, however, can easily be diverted to other uses unless firmly earmarked for such purposes (Regional Plan Association 1990).

### ***Grants and low interest loans***

A1.43 Grants and low interest loans are two types of incentives that can be used for protecting land and cultural resources. For example, the national government can provide grants to support state and local wetlands acquisition efforts or wetland restoration projects. In addition, commercial banks in conjunction with the government agency responsible for historic preservation may provide loans to owners of heritage buildings for their conservation, repair, or rehabilitation at rates significantly lower than the prime commercial rate.

A1.44 In the United States, the National Park Service makes federal funds available for surveys, planning, acquisition, and appropriate development of National Register properties. Under the Housing and Community Development Act of 1974, federal funds also are available for preservation. Under the National Housing Act, the Federal Housing Administration has the authority to insure property rehabilitation loans provided by private lenders (Mantell et al. 1990).

A1.45 Similarly, the Coastal Zone Management Act of 1972 provided funds for states to develop coastal zone management programs which includes the establishment of permissible activities within the zone, designation of critical environmental areas, and promulgation of guidelines on the priority of uses in the zone.

A1.46 In Turkey, the government provides subsidized credit for relocating polluting industries to alternative industrial zones. For example, leather tanneries relocating to the Maltepe Industrial Zone north of Izmir are entitled to subsidized interest rates of 35 percent for general loans and 22 percent for construction and infrastructure investment, implying negative real interest rates at an 80 percent annual rate of inflation. This is a clear incentive because interest costs in 1988 and 1989 account for 20 percent of total investment expenditures. Lastly, the federal government offers a 40 percent tax deduction on investment for tanneries relocating to another industrial zone during the first two years of estate construction and a seven percent reimbursement on investment for small and medium-scale tanneries (Kosmo 1989).

A1.47 Cultural resource conservation incentives have been very successful in many countries. Their success appears to result not from the existence of the incentives alone, but from the incentives in combination with associations of citizens and societies dedicated to the conservation of historic buildings and sites. Not only have these organizations helped to initiate the legislative and administrative measures containing these incentives, but they have educated and provided technical assistance to communities and local government in historic preservation. They also have raised funds for the purchase and preservation of such properties. Low interest loan pools and grants on a local

level are prime preservation incentives. Funds for loan pools and grants can be generated from a variety of sources, including local banks, corporations, foundations, local government general revenues, and community development programs (Taboroff 1991).

### ***Flood insurance***

A1.48 National flood insurance programs can provide a powerful incentive to local communities to enact floodplain zoning and control construction within river and coastal floodplains. In the United States, the National Flood Insurance Act of 1968, as amended by the Flood Disaster Protection Act of 1973, provides federally subsidized flood insurance for property in mapped flood-prone areas. In return, local and state governments must implement and enforce comprehensive floodplain management measures (including land use controls and building standards) designed to reduce flood damage. After a locality enters the program and complies with federal regulations, the local government must require that all development within the designated floodplain be designed and built to withstand a 100-year storm (that is, the storm with a one percent chance of occurring in any given year). Generally, this means that new development, including substantial improvements to existing structures, within the 100-year floodplain must be elevated above the flood level (Mantell et al. 1990).

A1.49 Another approach is to design non-traditional insurance schemes for very low-income households. For example, low-income families can join community savings plans that include insurance schemes. These plans can be organized and managed by local organizations such as community groups, thrift societies, or savings and loans. Under such a system, each household pledges to put a small amount into an interest-bearing savings account for a specified period (i.e., ten years). The organization managing the plan converts the money into hard currency and invests it abroad. Any interest earned on the account is distributed among the various depositors. If a disaster occurs during the ten-year period, the depositors are reimbursed for the amount they pledged to invest. Either they have savings accumulating over ten years or they have the assurance they will be covered if a disaster strikes (*Urban Edge* 1991).

### **Property Rights**

A1.50 Under this approach, the government establishes a system for clarifying land ownership and boundaries and provides secure tenure to land occupants in illegal settlements, including those in hazard-prone areas. This improves the efficiency of urban land development and will enable landowners to gain access to formal credit sources so they can invest in housing construction or improvements that will withstand certain hazards. Obtaining clear land tenure also may encourage households to demand rights to facilities and services that will improve health conditions in vulnerable areas. Establishing such a system, however, normally requires political will to institute land reforms at the national level and available expertise to review existing laws, integrate customary systems of land tenure with modern land titling systems, designing simple and efficient procedures for providing secure land tenure to low-income groups, and registering titles in legal cadastres. The provision of legal land tenure also may require a system of incentives to encourage low-income landowners to register their properties as well as measures to ensure that the provision of tenure does not encourage further invasions of hazard-prone lands.

A1.51 In Thailand, a flexible land titling system combined with other measures to cut down on land market regulations allowed the country to maintain land and housing costs that are unusually low relative to household incomes. Under this system, relevant information is recorded on the land title certificate which is held at the offices of the Lands Department and can be used to record any subsequent changes of ownership, rights, or obligations. There is no need for title searches or title insurance. Moreover, most transactions do not require lawyers because the Lands Department requires the use of standardized land sales contracts and other documents. Ownership transfers and recording of changes of rights and obligations can be completed quickly (Tanphiphat and Simapichaicheth 1990, cited in Peterson 1992).

### **Land Acquisition Alternatives**

#### ***Voluntary sale (fee simple acquisition)***

A1.52 Direct fee simple land acquisition by the government is often the only firm guarantee of land protection or land availability for public purposes. For example, governments commonly acquire sites for utilities, schools, hospitals, public housing, parks, and recreational areas. In Curitiba, for example, the municipal government acquired land adjacent or close to the new transport axes prior to their construction to allow the government to organize high density housing programs close to transport; consequently, some 17,000 lower income families were located close to these axes (Rabinovitch 1993). Although land acquisition can be an important tool for protecting sensitive land and cultural resources as well as managing development in hazard-prone areas, there are a number of disadvantages to this instrument. They include the high costs of acquiring land, the loss of local property tax revenues, and the often high costs of managing and monitoring public land. Moreover, in developing countries, where there are additional constraints imposed by poorly functioning land markets, land acquisition programs are rarely carried out efficiently.

#### ***Purchase and sellback (or leaseback)***

A1.53 Under a purchase and sellback (or leaseback) arrangement, government agencies can purchase land in fee, attach desired restrictions to the deed, and then resell or lease the restricted land. This approach is appropriate when the purchaser does not wish to continue to own the land with restrictions, or for some other reason, wishes to sell the land. For government agencies, it may be more worthwhile to purchase the land, attach use restrictions or other requirements, and then lease it to the original owner or to some other party who would assume liability and management responsibilities. The advantage of this approach is that it meets landowner needs for cash while retaining in government ownership only those rights needed to meet its land management objectives. Purchase and sellback also ensures that the government provides the property owner only those rights specified in the deed. Another advantage is that in the event of a dispute, the courts find more strength in a purchase and sellback arrangement than in an easement (see below) in protecting government interests (U.S. Department of the Interior 1982). The disadvantage of this arrangement, however, is that it cannot meet all land management objectives and that not all land is appropriate for applying this tool.

## ***Expropriation***

A1.54 The concept of expropriation is based on a sovereign's power of eminent domain, which allows the state to take private land for the good of the state. Expropriation is essentially a forced sale; the laws governing expropriation are as diverse as the countries' notions of the importance of private property and social land needs (Kitay 1985). Nonetheless, the permitted purposes generally include transportation; construction of public buildings (i.e., schools, government buildings, markets, factories); public utilities, and parks. In some cases, the public purpose encompasses the preemption of property misuse. In Ecuador, for example, the Municipal Regime Law authorizes municipalities to expropriate land that has not been put to a socially efficient use.

A1.55 Most developing countries have fairly extensive laws for expropriation. Although they vary a great deal in terms of power and authority, many exist in name only and are rarely used. One theory for this infrequent use is that many have been inherited from former colonial powers. The cost and time required to implement these outdated laws make them virtually useless. Moreover, many expropriation statutes are enacted without the support of a broad scheme of complementary powers of acquisition. In such cases, the expropriation laws have been undermined by private opposition to public land acquisition. Some advocates for private sector interests have been able to use the safeguards in expropriation statutes (the public purpose doctrine, just compensation) to frustrate and delay the use of such authority. Developing countries, therefore, should revise existing voluntary land acquisition laws that result in broad based laws that do not rely unduly on compulsory powers (Kitay 1985).

A1.56 Acquisition through expropriation (or voluntary sale) is seldom a complete response to managing sensitive land resources. For example, a land acquisition program for important wetland habitats can be frustrated by poor land use practices in the surrounding watershed, causing excessive siltation in the wetland basin. Beyond the problem of managing adjacent land uses, the acquisition must be supplemented by a vigorous management program. In the case of coastal zones, for example, this may mean monitoring easements or covenants to guarantee a free, well-signed public right-of-way or a well-protected endangered species habitat (Sorensen and McCreary 1990).

## ***Easements***

A1.57 An easement is a legally enforceable interest in land created by a transfer. Easements are used to preserve sensitive lands; provide public access along rivers or greenways; and allow landowners to obtain income, estate, and property tax benefits for land stewardship while they continue to live on their land. There are several types of easements:

- **Affirmative and negative.** Affirmative easements can establish rights to enter and use land for such purposes as the right of access for public services or recreation. Negative easements limit certain uses of land (i.e., residential development, filling wetlands, or limiting changes in the facade of a historic structure). There is no limit to the number of provisions that may be included in an easement and positive and negative conditions may be included.
- **Appurtenant and in gross.** An appurtenant easement benefits one parcel at the expense of another, usually adjacent, parcel whereas the easement in gross is one

where the holder of the easement does not own land adjacent to the property subject to the easement.

- **Implied and prescriptive.** Implied and prescriptive easements may be determined to have been established through historical use or necessity for access. For example, if a property owner sold part of his land to someone whose only access to it was across the remaining land of the seller, an easement of necessity would be implied to exist across the seller's land. Equity would "imply" the existence of an easement in situations in which it would be inequitable not to do so. If the purchaser had other reasonable means of access to existing roads, however, the way of necessity would not be implied. A prescriptive easement is one which is acquired by use over a long period of time without the landowner's consent, but with his knowledge. The period of time may be statutory, or the use may have existed for so long that the court will declare that the easement has been acquired by prescriptive use.

A1.58 Easements can be used most effectively when some—but not all—rights of ownership are needed to achieve specific land management objectives. For example, the protection of a scenic vista may require assurances that there is no construction of high-rise structures. An easement also can specify what uses will be allowed to continue and what uses will be restricted. These restrictions can be very precise (i.e., historic preservation easements may specify the color of facades or the type, size, number, and location of structures allowed on a particular parcel) or they can specify that the design and site plan is subject to approval by a managing agency. Easements are most useful when a private owner desires to continue uses that are compatible with public land management objectives. For example, owners wishing to continue farming operations may find an easement allowing public access to a shoreline or restricting intense residential development preferable to selling all of their interests in the land (U.S. Department of the Interior 1982).

A1.59 The advantages of easements are that current owners are not displaced, the public is not burdened with operating and maintenance costs, and the local government can continue to receive some tax revenues from the property. In addition, the acquisition of an easement can help protect more land than could be purchased in fee with limited funds. In applying this tool, however, government agencies should take into account that the use of this instrument for resource protection requires strong monitoring and enforcement capabilities and regular contacts with landowners to maintain cooperative relationships. Another consideration is that any restrictions on the land may lower its resale value.

### ***Purchase of development rights***

A1.60 Local communities can purchase the rights to develop selected parcels so as to protect environmentally sensitive or agricultural lands. Unlike zoning, which is subject to political pressures for change, the purchase of development rights provides permanent protection. These programs typically rely upon local bond issues or real estate transfer taxes for funding. After acquisition of development rights, for example, farms remain in private ownership, but the landowner has sold the right to develop the property. The advantages of acquiring development rights over fee acquisition is that acquisition of development rights is considerably less expensive (the local government only pays the difference in the market value of the parcel and its value for agricultural use rather than the

full market value for the entire parcel); the community avoids maintenance and management responsibilities; land remains on the tax rolls, although at a reduced assessment; and the local agricultural economy is bolstered by the funds to acquire the development rights because farmers invest the funds in farm equipment or supplies (Mantell et al. 1990).

### ***Land exchange***

A1.61 Public agencies may acquire land or interests in land by trading land or interests already under their jurisdiction. Exchanges may be for equal values or values can be equalized by payment of cash. They provide an opportunity to consolidate land holdings or acquire needed interests in land without using scarce public funds. To trade, a government will need a system for establishing the value of its tradable lands. Because of the difficulties in determining such values, barter may not be useful in compulsory acquisitions but important for voluntary transactions.

A1.62 Land exchanges occur frequently in developing countries. In Guatemala, barter is provided as a way of compensation in the acquisition of land. The Purchases Contracts Law provides that the public acquisition of land shall be done with or without payment and through barter or offset. In Jamaica, a number of exchanges were used to revitalize the Kingston waterfront area after port facilities were moved to another area of the city (Kitay 1985).

A1.63 In the Islamic countries, waqf are responsible for maintaining property belonging to religious institutions or earmarked for charitable or religious use. In many countries, considerable property is involved, particularly areas directly adjacent to mosques and madrasas. Although the waqf cannot sell property, they can exchange it. Their role in the conservation of heritage, however, has not been fully tested (Taboroff 1990).

### ***Exaction (dedication)***

A1.64 An exaction is a required dedication of land or fee payment from a private developer. In some cases, a developer seeking approval from a zoning commission will be forced to dedicate a percentage of his land to the public as a condition of obtaining zoning or building approval. The advantage of this tool is that new construction pays for its impact on open space. The disadvantages of this instrument is that it involves difficulties in calculating the developer's fair share of the costs.

### ***Donation and bargain sales***

A1.65 Donations and bargain sales are methods of acquiring land or interests in land at less than full market value. Under this approach, landowners can make gifts of the full or partial value of their land to government agencies or NGOs. For the government or private organization, receiving such a donation is the least expensive way to obtain land to meet environmental objectives. From the landowner's perspective, a full fee simple donation of land can provide maximum income tax deductions, where applicable. For example, a national income tax law can allow deductions from ordinary income usually equal to the value of the donation. The taxpayer's tax obligation is thereby reduced in proportion both to the donation and to the taxpayer's income tax bracket. Where large tracts of land are involved, developers may donate land to the public for schools or roadways, thus avoiding taxes on such land as well as implied duties to provide such facilities directly. The gift in such cases, when followed by state-financed school construction, will profit the donor by raising the

value of the remainder of his land. In considering a donation, landowners will have to assess their financial situation after sale, expenses, and taxes. If a landowner can receive as much money after taxes by donating all or part of the land instead of selling it, then the donation may be attractive.

A1.66 Donations of land for public purposes are not uncommon in developing country cities. In Thailand, for example, some cities (including Udorn Thani, Kamphaeng Phet, Phayao, Songkhla, and Khon Kaen) have built new parks and recreation facilities using land and money donated by private individuals and companies. In the Middle East, individuals give land to the religious authority to be held in trust for the benefit of the donor and his heirs. The gifts, which are motivated by a sense of religious duty, are administered by the state. In Egypt and Tunis, for example, separate ministries exist for the purpose of administering lands held under these trust arrangements. Much of the inner city land in Tunis comprise the medina or old city which is Waqf land, having been deeded to the religious authorities by private citizens (Kitay 1985).

A1.67 A bargain sale is a sale of property to a qualifying governmental body or NGO at a price that is less than its fair market value. The result, therefore, is part sale and part charitable contribution. The amount deductible as a charitable contribution for income tax purposes is the difference between the fair market value of the property and the actual sale price. Tax advantages can also accrue from full or partial donations or partial interests as well as from donations of full title in land. A land owner who donates a conservation or other partial interest to a government agency or a NGO, for example, may be able to deduct the value of that donation from his or her income taxes.

A1.68 Although donations and bargain sales have advantages for both the receiving agencies as well as the landowner, both approaches require cooperative land owners who can benefit from tax or other advantages and negotiations may be more complex than an outright purchase. In addition, the receiving agency must be willing to accept the donation and be capable of management responsibilities. In the case of a government agency, it also may lose tax revenues as a result of the donation (U.S. Department of the Interior 1982).

### ***Advance land acquisition (land banking)***

A1.69 Advance land acquisition (also known as land banking) is the strategic acquisition of limited amounts of land so as to control its use or pattern of growth, particularly when accompanied by targeted budgeting of capital resources. For example, advance acquisition can be used for acquiring the best sites for planned public facilities at a time when such sites are within the financial reach of the government, or for acquiring land along growth corridors (Kitay 1985). In practice, however, there are few successful applications in developing country cities due largely to the tendency of public agencies to become monopolistic. Nonetheless, advance acquisition can be considered more appropriate for restricting development in vulnerable areas (Kitay 1985).

## **Government Provision of Infrastructure**

### ***Providing basic infrastructure***

A1.70 Targeting resources for infrastructure provision (i.e., roads, sewers, water, electricity) can be the single most powerful tool, except for government acquisition and construction of housing and industrial facilities, for controlling land use. Landowners aware of plans for such investment

usually develop their adjoining areas to benefit from whatever increase values that arise. The extension of municipal services generally is governed by a city's capital improvements program, a timetable by which city authorities specify the timing and level of municipal services it intends to provide over a given period (i.e., five to ten years).

A1.71 Capital improvements programming can influence development location decisions; specific investments in drainage or other waste management services can reduce damages from future floods and provide for routine maintenance and environmental protection in hazard-prone lands. To carry out effective programs of infrastructure provision in developing countries, however, it will be necessary to strengthen institutional capacity, select appropriate technologies, and increase the availability of public funds and the ability to mobilize financial resources for these measures.

### ***Land readjustment***

A1.72 Land readjustment (also known as land consolidation or land pooling) is a method by which a public authority assembles land for conversion from rural to urban use, installs all public services, and finances the cost of the operation from the increase in land value resulting from the new infrastructure. The government sells enough of the serviced land to pay all of its costs; the remaining sites are returned to the original land owners in proportion to their initial land contribution. Essentially, a land readjustment scheme recovers for the public a part of the land developer's profit by making the public body the principal developer. The process is carried out through the manipulation of the title of the land itself, with only small exchanges of cash.

A1.73 By consolidating small property holdings and improving access and infrastructure, land readjustment can help remove constraints related to the development of otherwise inaccessible parcels of urban and suburban land. Because this instrument helps to bring this land to the market for more efficient use and development, it reduces pressures on agricultural land in the urban fringe and increases the efficiency of existing urban services. It also reduces public costs for infrastructure provision. A disadvantage of land readjustment is that it reduces the area of each owner's property. This approach, therefore, will be effective only where property owners have difficulty obtaining infrastructure through other means and where the demand for serviced land is sufficient to compensate the owner for this loss of area by making the remaining property more valuable.

A1.74 Land readjustment has been effective in Taiwan, Korea, Japan, and Germany. The technique also has been adopted in Indonesia and Nepal. In Indonesia, the National Land Agency has implemented about 45 land readjustment projects covering 18 provinces; another two pilot projects have been carried out by local governments in Bandung and Bogor (*see* Box 13). Also in Indonesia, the National Urban Development Strategy (NUDS) for the period 1985 to 2000 proposes a combination of Guided Land Development (GLD) and Guided Kampong Development (GKD) based on the provision of urban infrastructure as the desirable approach for achieving planned urban expansion in Indonesia. In Nepal, guided land improvement is an adaptation of the GLD technique to improve a partly developed suburban area through such measures as widening and straightening existing roads and making new roadways and laneways to "open up" pockets of landlocked parcels for urban development. The improvement schemes also might include road and drainage construction works and utility service lines if the landowners are willing to contribute to the cost of such works (Archer 1990).

## **Information and Education**

### ***Remote sensing***

A1.75 Remote sensing refers to the process of recording information from sensors mounted either on aircraft or on satellites. Satellite remote sensing can be used to gather strategic planning information pertaining to a district or an entire city. Among other uses, the technology can be applied to base mapping, land use and land cover mapping, analysis of urban growth patterns, and natural hazards management.<sup>3</sup> For example, the technique is applicable to natural hazards management because nearly all geologic, hydrologic, and atmospheric phenomena are recurring events or processes that leave evidence of their previous occurrence. Remote sensing data reveal the location of previous occurrences and/or distinguish the conditions under which they are likely to occur. It therefore makes it possible to identify areas of potential exposure to natural hazards so that measures to reduce the social and economic impact of potential disasters can be introduced into the planning process. Remote sensing also is useful for disaster monitoring and post-disaster assessment (Morgan 1989).

A1.76 Remote sensing technology includes aerial remote sensing (i.e., aerial photography, radar, thermal infrared scanners) and satellite remote sensing (i.e., Landsat, SPOT, satellite radar systems) and can be especially useful for obtaining accurate and timely information about the nature of a hazard, or for gathering rapid, low-cost reconnaissance information over large, often isolated areas where data collection may otherwise be very cumbersome (Morgan 1989). Since 1986, for example, SPOT I, a satellite financed by France, Belgium and Sweden, has been sending images with eight times the spatial resolution of Landsat and other civilian satellites. In a continuous regular orbit, SPOT I provides up-to-date images of urban centers throughout the world. Detecting changes in the urban environment can be conducted by purchasing images at regular intervals (Bertaud 1989). The value of remote sensing data will depend on skilled interpretation used in conjunction with conventionally mapped information and ground collection data (OAS 1991). Moreover, the successful application of this technology will depend on the existence of an information management policy that deals with such matters as institutional mandates and linkages, technology strategies, human skills development, and financial management (Paulsson 1992).

### ***Geographic information system***

A1.77 A geographic information system (GIS) is a tool for systematically collecting, organizing, combining, modelling, analyzing, and presenting various data about a geographic area. It can contain mapped information revealing spatial relationships between various attributes such as hazardous events, natural resources, and socioeconomic conditions. The rapid development of microcomputer systems has made this technology readily available, at relatively low cost, for a wide range of applications, including land registration, resource management, coastal zone management, and hazard management. It can be used to determine likely land use conflicts, predict environmental impacts on a spatial basis, and assist in making resource allocation and development decisions. In

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3. See Bengt Paulsson, "Urban Applications of Satellite Remote Sensing and GIS Analysis" (Urban Management Programme Discussion Paper Number 9, 1992) for a detailed discussion of this instrument, its application, and related technology and institutional issues.

### Box 13. Land pooling/readjustment in Indonesia

In Indonesia, the National Land Agency (BPN) undertakes land pooling/readjustment (LP/R) projects to prepare urban fringe agricultural lands for urban development. Unlike land readjustment projects in Taiwan, these projects do not include the construction of the infrastructure network. They have been designed to create a planned layout of roadways; obtain land for roads and other public uses (at no cost to the government); regularize the shape of the land parcels and provide each parcel with road access; and provide the landowners with registered titles for their reconfigured land parcels. Although the projects usually include some road infrastructure and drainage works, the construction of network infrastructure is not included, but provided by the local government and public utility authorities.

The main reason that the BPN projects are limited to the land components of land readjustment is that they reflect its land functions and priorities. The projects allow BPN to implement planned subdivision layouts in the absence of subdivision laws and regulations, acquire the land required for public and community purposes in the absence of an effective land acquisition law (and with very limited funds available to pay compensation), and to confirm and record land ownership where many landowners do not have registered titles. The second reason is that BPN does not have the legal power to retain and sell project land for cost recovery. A third reason is the doubt as to whether all the landowners would allow an additional portion of their land to be sold for cost recovery. Currently, landowners give up about 20 percent of their land for roads, drains, school sites, etc. To achieve cost recovery, they would need to give up another five to ten percent. Even though the net increase in the value of the remaining land would more than compensate them for this additional loss, some landowners would be unwilling because they prefer to continue farming their land or because they think that the government should continue to pay for the infrastructure works.

Although BPN's projects provide valuable benefits, it could in many cases achieve additional benefits through the inclusion of infrastructure, particularly in projects on suburban land "ripe" for immediate subdivision and development. Because the government has sufficient expertise in LP/R, it could promote and facilitate complete projects by passing a law to authorize and regulate LP/R projects. This law also should provide for: majority landowner approval of each proposed project; equitable sharing of project costs and benefits among landowners; preparation, publication, and implementation of each project scheme; standard project preparation and implementation procedures; raising project loans; and retaining and then selling project land for cost recovery and loan repayment.

Source: Archer (1990)

Angola, for example, a World Bank-financed project in Lobito Benguela includes a low-cost GIS for multiple purposes (*see* Box 14).

A1.78 To manage natural hazards, GIS can support planners at different levels of government in assessing the impact of natural events on existing and proposed development activities (OAS 1990). At the national level, for example, planners can use GIS to categorize land with regard to natural hazards and determine whether and to what extent natural phenomena pose a significant danger. At the regional level, GIS can be applied to more detailed studies to identify development potential and hazard-related constraints of selected areas. At the local level, planners can use GIS to formulate projects at the pre-feasibility and feasibility levels to locate vulnerable lifeline network elements (i.e., ports and airports, hospitals, health centers, police stations, fire stations, schools, energy infrastructure, road network, emergency management facilities, telecommunications) and hazard-free areas suitable for urban expansion or resettlement (*see* Box 15). In Colombia, the Puerto Bogota Department of Cundinamarca used GIS to identify hazard-free urban areas suitable for the relocation of 34 families living under high landslide risk.

A1.79 Although a GIS has many potential applications, it may not be applicable to a given situation and it may not be self-financing. Moreover, for a PC-based GIS, there are many possibilities

**Box 14. Low-cost GIS in Lobito Benguela**

In Angola, the Lobito Benguela Urban Environmental Rehabilitation Project includes the development of a GIS that is a user friendly, low-cost desktop computing facility for processing, using, and printing digital maps and images. The two primary tasks of the GIS are 1) to design and implement a Land Registration GIS system (LARGIS) in support of tax management for overall project cost recovery; and 2) to provide technical support for the environmental and low-income sanitation components, and mapping for the environmental management and monitoring studies. The budget to complete the development of the GIS, which covers the Lobito-Benguela conurbation (population of 800,000) is US\$336,000, of which US\$135,000 is for a short-term consultancy; US\$79,000 is for computer equipment, site preparation, and supplies; US\$57,000 is for overseas training; and US\$65,000 is the value assigned to local salaries which is the responsibility of the Provincial Government.

*Source:* World Bank (1991)

among hardware and software combinations. In developing countries, the system to choose should be simple and affordable. Sophisticated systems require highly specialized technical skills and may be difficult to maintain and repair locally. For the purpose of map analysis for hazards management, their capabilities may not be worth the additional cost. Other considerations in selecting GIS options include data availability and the need for cooperation among the various institutions involved in collecting, generating, and using data (OAS 1991).

***Land information system***

A1.80 A parcel-based land information system (LIS), sometimes referred to as a multipurpose cadastre, is a tool for legal, administrative, and economic decision-making and an aid for planning and development. It consists of a data base containing spatially referenced land-related data for a defined area as well as procedures and techniques for the systematic collection, updating, processing, and distribution of the data. The base of a LIS is a uniform spatial referencing system which links the data within the system with other land-related data. It includes data on land ownership, location, values, and other attributes such as land use or infrastructure. Although there is no international agreement on what constitutes appropriate technology in this field, past experience has shown that new systems should be designed so as to be efficiently operated with existing resources plus a minimum of foreign input. The system also should be easily understood and accepted by landowners and users, continuously updated, and cost-effective (Bernstein 1986).<sup>4</sup>

A1.81 A properly functioning parcel-based LIS can provide many benefits to local governments and private landowners. For local governments, it facilitates urban planning, land administration, land management, provision of infrastructure, property taxation, and environmental assessment. For individuals and private enterprises, the LIS facilitates real estate transactions by reducing transfer costs and eliminating delays when boundaries and ownership must be established prior to a transfer; reducing litigation and associated costs; improving accessibility of land information and thus allowing a geographically larger and more competitive land market; and by increasing the availability of loan financing for all types of development or improvements (that is, by providing credit institutions with reliable records of the extent and security of ownership). With respect to this

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4. Parcel-based land information also is contained within legal cadastres (title registers) and fiscal cadastres (tax rolls) that may or may not be computerized.

### **Box 15. Application of GIS to urban expansion and resettlement**

Tegucigalpa, capital of Honduras, is a hilly city on geologically unstable ground, constantly suffering damaging landslides. In 1987, an OAS/DRDE study identified more than 300 landslides occupying an area of approximately 1,350 hectares within the metropolitan area and determined that 20 percent of that area presented high to extreme landslide hazard susceptibility. The situation has since been aggravated by increasing rural migration, frequently occupying steep areas of questionable stability. City officials had two urgent tasks: identify landslide-hazard free urban expansion areas for new settlement and resettlement programs, and delineate priority areas where hazard mitigation should be considered.

By entering data on land use, landslide hazard susceptibility, topography, slope, and protected areas, a GIS database was created to identify areas potentially suitable for expansion. City officials could then set minimum criteria for areas of new development (that is no more than 5 percent of the area can be subject to landslide hazard, no access road can be located within 1000 feet of a 20 percent slope, etc.). Using the GIS, areas meeting the criteria could be identified. The number of people living in extreme and high landslide hazard areas also could be determined, providing the basis for selecting priority areas for implementing prevention measures (for example, relocation, construction, retrofitting).

For this exercise, the advantages of using GIS as compared to manual mapping techniques are obvious. Not only does GIS afford great time savings for the overlay, display, assessment, and analysis of hazardous areas, but GIS offers flexibility in selecting the minimum standards. Tentatively selected standards can be tested for feasibility and adjusted accordingly. Using a GIS, this process would take minutes in contrast to manual methods, which would take a week of redrafting and recalculations.

*Source:* OAS (1991)

latter benefit, accurate legal information is of central importance to the conservation of cultural resources as well as to the protection of low-income populations occupying hazard-prone lands.

**A1.82** Although there are many benefits to improving land information, developing country governments are not always eager to launch programs to upgrade existing cadastres or establish new systems. The establishment of a new land information system is costly and there are no immediate tangible and quantifiable benefits. In numerous countries, there may be direct opposition to a modern land information system. Tribal or ethnic groups may be fearful that customary law will be violated or powerful landowners may resist such systems because they prefer that the extent of their holdings not be publicized. Other constraints to establishing effective system are possible security restrictions and the lack of expertise to properly interpret, update, and maintain the data.

### ***Coastal atlases and data banks***

**A1.83** Coastal atlases and data banks refer to the systematic compilation, interpretation, and display of information linked to a specific set of coastal issues, organized for an entire state or nation. Through this approach, coastal management programs can be established that will balance natural resource use and maintenance of environmental quality by adjusting use according to resource capacity. The information in a coastal atlas should be issue-oriented; collected consistently for the same parameters, preferably at the same scale, on a national or state-wide basis; compiled and synthesized in meaningful ways, using consistent weighing and scaling techniques; and easily retrievable. The atlas also should include a set of maps prepared on a common scale. In some cases, the map may represent the final output of the data base. In other cases, preparation of a series of descriptive and interpretive maps may be part of the analytic effort (Sorensen and McCreary 1990).

A1.84 Coastal zone atlases and data bases can play a central role in facilitating an integrated and informed approach to coastal resource management. By drawing together data from on different aspects of the coastal environment (i.e., mangrove locations, land use designations, hazards), they can be used as tools for flagging problems, especially those that need immediate attention. The Philippines Coastal Zone Program has undertaken a program of data collection for selected areas through LANDSAT images (see section on remote sensing). A national survey of coastal resource use also was undertaken. Sri Lanka is preparing maps of the coastal zone with U.S. AID-supported technical assistance.

A1.85 In considering the design of coastal atlases and data banks, several factors will need to be considered. First, these tools must be linked to a process of interpretation, policy setting, and appropriate intervention. Second, the value of coastal data banks or atlases will be dependent on the quality and quantity of raw data. In most developing countries, the available data is often uneven with regard to accuracy and consistency of coverage. Third, the methods by which data is compiled, scaled, and aggregated have an equal impact on the utility of the data base or atlas. This is especially evident in considering the map scales at which data is obtained and reproduced. For example, maps compiled at 1:120,000 or 1:125,000 are useful for large-scale regional planning, but much larger scales (i.e., 1:24,000) are needed for preparing land use plans. Even more detailed maps are needed for site plans. Fourth, atlases and data bases quickly become obsolete unless there is a commitment to their timely use and continual updating. Lastly, building an atlas or data base is costly in dollar and staff terms. It should not be undertaken without a clear realization of both start-up and maintenance costs (Sorensen and McCreary 1990).

### ***Multiple hazard maps***

A1.86 The multiple hazard map (MHM) is a tool for analyzing the vulnerability and risk of more than one hazard in an area, especially when combined with the mapping of critical facilities (see below). It can be used for synthesizing the characteristics of natural phenomena and their possible impacts from different sources; flagging hazards that may trigger other hazards or exacerbate their effects; obtaining a more precise view of the effects of natural phenomena on a particular area; identifying sub-areas that require more information, additional assessment, or specific hazard-reduction techniques; allowing land use decisions to be based on all hazard considerations simultaneously; and supporting emergency preparedness planning (OAS 1990). The content and accuracy of an MHM, however, is only as good as the hazard information supplied. Moreover, the use of this tool in hazard management requires specialized expertise.

### ***Critical facilities maps***

A1.87 The main purpose of a critical facilities map (CFM) is to provide planners and decision makers with accurate and clear information about the location, capacity, and service area of critical facilities (that is, all man-made structures or other improvements whose function, size, service area, or uniqueness gives them the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if they are destroyed or damaged or if their services are repeatedly interrupted). When combined with a MHM, a CFM can indicate those areas requiring more information, those requiring different hazard reduction techniques, and those needing immediate attention when a hazardous event occurs (OAS 1990). For example, the location of a critical facility in a hazardous area alerts planners and decision makers to the possibility of a certain facility

confronting serious problems. A vulnerability assessment (see below) based on a careful analysis of equipment and the type, use, and condition of the facility would follow. Based on this assessment, planners would incorporate appropriate hazard reduction techniques into each stage of the planning process so as to avoid or substantially reduce social and economic impacts from natural and other hazards. The main limitations of this technique are that the conclusions regarding the performance of facilities are hypothetical, damage assessments may be based on a specific scenario that is substantially different than the actual event, service area boundaries may have been based on settlement patterns rather than actual boundaries, and the scale of the map may provide insufficient detail to allow the maps to be used for individual facility studies (OAS 1991).

### ***Natural hazard assessment***

A1.88 Natural hazard assessments provide information on the probable locations and severity of dangerous natural phenomena and the likelihood of their occurring within a specific time period in a given area. These studies rely heavily on available scientific information, including geologic, geomorphic, and soil maps; climate and hydrological data; topographic maps; aerial photographs; and satellite imagery. Historical information (written and oral accounts) from long-term residents also helps characterize potential hazardous events. The natural hazard assessment evaluates the threat of natural hazards, identifies additional data needs for a definitive evaluation, and recommends appropriate means of obtaining the data (OAS 1990). Specific assessments of natural hazards cover flood, landslide, geologic, and hurricane hazards.

### ***Vulnerability assessment***

A1.89 Vulnerability assessments estimate the degree of loss or damage that would result from the occurrence of a natural phenomenon of given severity. The elements analyzed include human populations; capital facilities and resources such as settlements, lifelines, production facilities, public assembly facilities, and cultural patrimony; and economic activities and the normal functioning of settlements. Vulnerability can be estimated for selected geographic areas (i.e., areas with the greatest development potential and already developed areas in hazardous zones). The techniques include lifeline (or critical facilities) mapping and sectoral vulnerability analyses for sectors such as energy, transport, agriculture, tourism, and housing (OAS 1990).

### ***Cultural resources inventory and registration***

A1.90 An essential tool for protecting cultural resources is a systematic inventory and registration of significant cultural resources or historic structures by a government agency or private commission. Such an inventory may include monuments (buildings, fortifications, sculptures, paintings, inscriptions, archaeological features); groups of buildings (historic town center, streetscape, district); and sites (historic landscapes, archaeological sites, historic sites). In the inventory of these resources, experience in countries such as Italy and Yugoslavia confirms that an architectural survey for historic sites should be undertaken at a scale of 1:200. For the conservation and rehabilitation of single buildings, the survey would be accomplished at a scale of 1:50; architectural parts and details should be documented in larger-scaled (for example, 1:20) architectural drawings (Taboroff 1990). Inclusion in such an inventory as well as registration can give the resource visibility and some degree of protection.

A1.91 As part of a local conservation organization's (Stari-Grad) actions to preserve and restore the historic center of Mostar (in the former Yugoslavia), it surveyed and mapped the core of the old town and numbered, registered, and mapped (at a scale of 1:500) every historic building or group of structures. Foundations, facades, and sections were drawn at 1:200 and again at 1:50; specific details were recorded at 1:20. All data pertaining to a given structure were collected, including historic photographs, drawings, and historical references. On-site archaeological and historical art analyses and investigations also were carried out. Three years were required to document every building in the zoned area (Taboroff 1990). Another significant effort to protect cultural patrimony in the Mediterranean is the list of 100 historic coastal sites of common Mediterranean interest (*see* Box 16).

A1.92 Although the listing or registration of cultural resources can provide protection from unlawful demolition or alteration, the presence of a substantial number of listed buildings or monuments in a town may impose a significant financial burden on those responsible for their maintenance. The financial resources required for protecting these historic buildings might otherwise be spent on more pressing aspects of urban development such as the improvement of slum conditions or severe air pollution or water and sanitation problems.

### ***Environmental impact assessment***

A1.93 An environmental impact assessment (EIA) is a tool for analyzing the potential environmental impacts of a proposed project and its alternatives prior to implementation so as to ensure that the proposed project or action is environmentally sound and that any environmental consequences can be recognized early and taken into account during the project design. EIAs normally cover baseline environmental conditions; potential environmental impacts (both direct and indirect); comparison of the environmental impacts of alternative investments, sites, technologies, and designs; preventive, mitigatory, and compensatory measures; required environmental management and training; and provisions for incorporating input from the general public as well as monitoring project impacts.

A1.94 As part of an EIA, the potential impacts of a project on surrounding communities and sensitive natural and cultural resources will need to be considered. In the case of industrial development, for example, the EIA should address specific concerns related to pollution, proximity to surrounding settlements, and risk of accidents. With respect to natural hazards, however, the EIA should address whether or not a proposed project will be affected by natural hazards, and if so, what measures will be taken to mitigate impacts. In Thailand, for example, the EIA process frequently has been used to mitigate unacceptable degradation of beach resources and nearshore waters, especially with regard to hotel construction and operation (Dobias 1989). The EIA also should serve as vehicle for analyzing the impacts of development alternatives on disaster vulnerability and for identifying disaster prevention and loss reduction measures. Among other considerations, the World Bank's Environmental Sourcebook (1991) outlines the following steps in carrying out an assessment of natural hazard risk:

- Identify specific natural hazards, including natural hazard characteristics, distribution, intensities, qualities, and historical records to review frequency, and probability of occurrence and regional and local characteristics.

**Box 16. One hundred historic sites of common Mediterranean interest**

To protect cultural patrimony in the Mediterranean, one activity of UNEP's Mediterranean Action Plan is the list of 100 Mediterranean sites prepared by ICOMOS (International Council on Monuments and Sites). The list encompasses 100 archaeological and historical sites of the Mediterranean civilization (excluding those in the Alpine and Balkan regions) that meet at least one of five criteria:

- 1) it must illustrate one of the great Mediterranean civilizations (for example, Phoenician, Greek, Roman);
- 2) it must have had a considerable influence on the development of architecture and the arts;
- 3) it must have played a major role in the history of trans-Mediterranean relations (for example, between East and West);
- 4) it must bear witness to an autochthonous civilization, yet be specific to the Mediterranean (Phrygian or Etruscan, etc.); and
- 5) it must be directly and materially associated with a major event in the history of the Mediterranean world (this criterion is acceptable only if combined with at least one of the other four).

Among the 100 proposed sites are those that already are included in the World Heritage List established as part of the World Heritage Convention for the protection of the cultural and natural heritage. For example, the list includes Cairo, Tunis, Carthage, Kerkouan, Dubrovnik, and Split.

*Source:* Taboroff (1990)

- Identify the critical sectors in the economy and natural resources that may be impacted by the identified hazards, analyze the constraints and conflicts that may be imposed by the natural hazards on each relevant sector and on natural resources, and examine the possible structural and non-structural actions required to mitigate risks.
- For each sector/area at risk, examine standards, and design criteria and maintenance practices that may foster vulnerability and make appropriate changes to help reduce it.
- Examine the institutional capabilities for disaster prevention and mitigation at the national, regional, and local levels, highlighting inter-institutional coordination mechanisms and areas that may require strengthening.
- Identify the specific capabilities of local NGOs in vulnerability reduction activities, particularly concerning community involvement, education, and training.
- Examine the existence or need for disaster prevention and mitigation policies and regulations at both the local and national levels.

**A1.95** As part of the assessment, the capacity of existing institutions to develop policy on natural hazards and to implement that policy through regulatory, economic, and other instruments should be evaluated. Similarly, the institutional capacity to develop and implement education and training programs should be assessed (World Bank 1991).

A1.96 Fortunately there is now a greater awareness of the negative impacts of infrastructure projects and need for environmental assessments prior to construction. The German Government, as a result of its financing of a project for the paving of the Modesto Mendez Highway in the Peten, has provided funds to complete field surveys for part of its Archaeological Atlas. Restrictions were placed by the government on a French-financed refinery that was to be built in the north of the Peten. Another case occurred at the archaeological site of the Ceibel where Exxon was slated to begin drilling for oil. This was stopped due to protests of officials at IDAEH and the site archaeologist (Taberoff 1991).

### ***Land market assessment***

A1.97 A land market assessment (LMA) is a tool that provides an accurate and up-to-date data base on the operation of the land market in a particular urban area. It assesses the current condition of the land market (i.e., which land uses are growing the fastest, where is urban land conversion taking place, where is urban land conversion outstripping the supply of serviced land, whether greenbelts or agricultural land preservation are limiting development, whether planning standards and building codes pushing up housing prices) and can be used to estimate future urban land requirements for residential, commercial, and industrial uses. LMAs can support four broad activities: government planning and decision making; evaluating government policies and actions; structuring land-based taxation systems; and private sector investment and development decision making.

A1.98 The most significant benefit of the LMA is that it helps improve the quality of land development planning and policy making by providing public officials with the basic assessment of the state of the land market. It also serves as a base for monitoring land markets so that the effects of various policies can be evaluated. Initiating an LMA, however, requires expertise in market survey techniques, interpreting aerial photography and satellite images, data base management, and computer systems. Moreover, the costs of conducting and interpreting aerial surveys can be substantial, ranging from US\$25,000 to US\$200,000 depending on the method used and the size of the metropolitan area. The costs to obtain and interpret satellite images, by contrast, can be substantially cheaper, between US\$5,000 and US\$10,000 (Dowall 1990).

### ***Advisory guidelines***

A1.99 Advisory guidelines are formulated to provide a framework for issuing permits as well as preparing land use or special area plans. Unlike mandatory policies, they do not require preparation of a specific plan or implementation measures, but they provide a valuable educational function. They can offer general directions for project design and construction and raise the level of awareness and understanding among agency and government staff. The process of drafting and revising guidelines also serves as a vehicle for intergovernmental communication as well as a forum for government agencies and interest groups concerned about land or cultural resources (*see* Box 17). In addition, guidelines can sensitize planners and policy makers in different sectoral or functional divisions to issues that require horizontal or vertical integration of government efforts. They also can provide guidance to the private sector involved or interested in developing land in sensitive areas such as coastal zones. In some cases, advisory guidelines contain hidden powers because of the strength or influence of the agency issuing them. The perceived threat of the formal imposition of the guidelines by law also may inspire voluntary compliance by developers (Sorensen and McCreary 1990).

**Box 17. Guidelines for coastal areas in Indonesia**

In Indonesia, the adoption of "General Guidelines on the Development and Management of Coastal Areas" was accomplished through the joint efforts of the Indonesian National Committee on the Environment, the Indonesian Institute of Sciences, and other leading universities. The guidelines were organized according to the following: inventory of natural resources; human settlement; land use and development allocation; environmental considerations in project planning and development of coastal resources; food production and raw materials; conservation and environmental protection; recreation and tourism; infrastructure and engineering works; construction materials; public health; management of water resources; institutional framework; navigation, shipping, and harbors; and security. Prior to adoption, review copies of the guidelines were circulated to a variety of government departments and used for six years. The Office of the Minister for Development Supervision and the Environment (successor to earlier environmental agencies) plans to revise the document to reflect both users' comments and environmental laws.

*Source:* Sorensen and McCreary (1990)

***Public education and participation***

A1.100 Public education and participation is critical for achieving the various land management and environmental objectives discussed in this paper. In the case of managing hazard-prone lands, for example, public education should be provided to urban land managers and local populations affected by natural and man-made hazards. Information is needed on the nature of local hazards, the critical facilities that would be affected, as well as measures for hazard mitigation. Local populations also need information on how to build or rebuild their homes or businesses so they will not be damaged or destroyed in subsequent floods, hurricanes, or earthquakes. To facilitate the public education process, there is a major role for community-based organizations (CBOs) and non-governmental organizations (NGOs) which can provide technical support and critical information for improved health and environmental conditions in poorly serviced areas.

A1.101 To protect cultural resources, public education and formal professional training programs are needed in most developing countries. For example, public education programs involving media coverage, preparing and distributing brochures on historic preservation as well as publications and walking guides, and courses in historic preservation and archaeology can sensitize local populations to the value and vulnerability of their cultural heritage. These programs can be implemented by government agencies or NGOs and should be targeted to the general public, owners of historic properties, students, tourists, and local architects and city planners who make planning decisions (*see* Box 18). Formal training programs to develop decision making skills as well as to introduce preservation planning, analytical technologies, and related financial management also can be developed for senior staff of national ministries responsible for culture and antiquities as well as historic preservation.

A1.102 Public participation in decision making affecting sensitive lands should be a priority for any management program. In the United States, public participation in coastal decision making is one of the priority objectives of the national Coastal Zone Management Program. In each state participating in the program, the practices and procedures are similar: laws adopted by each state are subjected to public hearings and comment prior to enactment; agency adoption of rules, standards, and regulations require public notice of intent, hearing, and debate before and among members of

**Box 18. Role of NGOs in historic preservation**

In Rattanakosin and Chiang Mai, Thailand, NGOs have played an important role in conserving valuable old buildings and in ensuring that new development is compatible with the historic character in old town centers. In Chiang Mai, competitions and other local events have been organized to raise awareness of building design issues. Through these means, communities will support and assist the municipality in ensuring that conservation and development proceed together. In Rattanakosin, an old area of Bangkok, the municipality cooperated with universities and local professional organizations to produce plans and building control guidelines which can be used by developers and provide a basis for producing a stylistically consistent townscape.

*Source:* GTZ (1992)

the coastal zone managing board; extensive public meetings in affected areas are required prior to designation of specially protected areas; permits for major development activities are reviewed by permitting agencies and require public comment; when a permit application is received, it is normal for the permitting or coastal agency to notify the local governing board as well as adjacent property owners to solicit their comments; permits may be appealed by individuals or organizations who may be affected or who have an interest in the proposed activity; and citizens are heavily involved in the coastal zone management process in each state (Marzin 1990).

## **ANNEX B: RELATED URBAN MANAGEMENT PROGRAMME PAPERS**

*Toward Environmental Strategies for Cities: A Framework for Urban Environmental Management in Developing Countries* by Carl Bartone, Janis Bernstein, and Josef Leitmann (forthcoming)

*Urban Property Tax Reform: Guidelines and Recommendations* by William Dillinger (UMP 1)

*Alternative Approaches to Pollution Control and Waste Management: Regulatory and Economic Instruments* by Janis Bernstein (UMP 3)

*Priorities for Urban Waste Management and Pollution Control* by Janis Bernstein (forthcoming)

*The Land Market Assessment* by David Dowall (UMP 4)

*Reforming Urban Land Policies and Institutions in Developing Countries* by Catherine Farvacque and Patrick McAuslan (UMP 5)

*A Framework for Reforming Urban Land Policies in Developing Countries* by David E. Dowall and Giles Clarke (UMP 7)

*Urban Applications of Satellite Remote Sensing and GIS Analysis* by Bengt Paulsson (UMP 9)

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