

6. Managing Hazard-Prone Lands in Cities of the Developing World

Janis D. Bernstein

Introduction

The unprecedented growth of cities in the developing world has greatly intensified the demand for urban land. In most cities, the shortage of serviced land and the competition for that land have priced the urban poor out of the legal land market. Many low-income populations, therefore, are forced to occupy illegal settlements on low-lying lands, steep hillsides, floodplains, or other hazard-prone areas. By inhabiting such areas, these groups become vulnerable to significant health risks from flooding, landslides, mudslides, or other natural hazards; their dwellings and infrastructure are subject to accidents, massive damage, and collapse. In other situations, squatters occupy lands adjacent to polluting industrial or waste disposal facilities. In these areas, the poor are the most vulnerable to pollution-related health threats and environmental disasters. This paper characterizes the underlying causes of land occupation in hazard-prone areas and presents alternative land management approaches for addressing this problem in cities of the developing world.

Why the urban poor occupy hazard-prone areas

Low-income populations occupy hazard-prone areas because they do not have the financial resources to compete for desirable serviced urban land in safe locations; hazard-prone areas may be the only land available for squatter or other low-income settlements. In some cases, the urban poor choose to inhabit marginal lands near the inner city to have access to central area employment opportunities—even when affordable land is available on the urban fringe. The cost of commuting to the central city may be prohibitive for those earning a living from

casual employment (Baross 1983). In most developing countries, however, the underlying causes of urban land shortages that drive low-income groups to hazardous areas are not always recognized. In many cities, the scarcity of land is artificially induced by imperfections in urban land markets and ineffective land management practices, often because of inappropriate land regulation, lack of secure tenure, inadequate information, and inappropriate taxation.

Inappropriate regulation

Inappropriate regulation is probably the most important factor accounting for urban land shortages and the location of low-income populations on hazard-prone lands. In some cases, the problem lies in excessive regulation, whereby land development standards artificially reduce the supply of land by requiring large lot sizes or excessive amounts of land for open space and circulation within subdivisions. In other situations, low-income groups occupy poorly serviced, hazard-prone areas because local authorities governments have not formulated effective land use policies, laws, and standards that address development in these areas or because they have not adequately enforced existing regulations.

Excessive regulation

By reducing the amount of land in the formal market, excessive zoning restrictions and subdivision regulations have increased costs and thus constrained access of low-income populations to environmentally safe lands in desirable locations. In Serpong (southwest of Jakarta), for example, the zoning plan restricts residential use to only 34 percent of the total land area. The areas zoned residential (that is, where formal development is allowed) do not necessarily coincide with land that is ready for development or where

developers feel that residential demand exists. Hence, 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 have to rely on infrastructure not yet built. Because no developer can risk acquiring land in areas without access, the area of developable land 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).

In addition to restricting land uses, zoning regulations can control population densities. Planned densities are usually much lower than the actual densities in middle-income residential developments. For example, planned densities in residential areas of Serpong have an average of 56 persons per hectare. By contrast, densities in middle-income developments vary from 300 to 500 persons per hectare, which corresponds to plot sizes ranging from 60 to 90 square meters. The amount of land per household that corresponds to the permissible density is about 830 square meters. This would produce an average plot size of 500 square meters, which would be affordable by only about 5 percent of the urban population (Bertaud 1989).

Excessive subdivision regulations also increase costs for urban land. For example, local governments in developing countries often adopt standards for road surfaces, building materials, plot sizes, and floor areas that are comparable to or exceed standards common in developed countries. In Malaysia, for example, the area per house provided with roads is up to four times greater in the typical Malaysian subdivision than in comparable projects in North American or Western Europe. Based on international practices, about 25 percent of the land set aside in Malaysia is wasted; streets are too wide, the setbacks are excessive, and the land is dedicated for redundant facilities (World Bank 1989). Because 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, they restrict the poor to housing that lacks even the most basic public health provisions.

In addition to excessive land use controls, complicated time-consuming procedures for obtaining clear titles and permission for development present added costs. According to de Soto (1989), for example, land titling in Peru takes 207 bureaucratic steps by 48 different government agencies, which requires about 43 months to complete. In Indonesia as well, obtaining proper title for projects can take a long time, depending on the legal status of the land, its intended use, and the desire of the owners to sell. In West Java, land transfers take an average of 32.5 months to acquire title to property. In addition to lengthy time, complex titling requirements add between 10 and 29 percent more to the cost of acquiring land (Dowall and Clark 1991).

Procedural delays in obtaining development permits explain why the increase in housing prices in Malaysia substantially exceeded those in Thailand over the same time period. In Malaysia, prices of newly-built housing increased by an annual rate of 18.9 percent between 1972 and 1982, a rate about triple the overall increase in consumer prices and about four times the increase in housing prices experienced in Thailand. According to a World Bank report (1989), the factors for such an increase in Malaysia's housing prices can be attributed to high government-imposed housing standards, overly complex and time-consuming housing project approval procedures, the sluggish response of the housing industry to increases in housing prices, and high housing demand. For example, it takes between five and eight years to obtain all the necessary permits for subdivision approval from 15-20 government agencies. In Thailand, by contrast, it takes about five months to obtain subdivision approval from five government agencies (World Bank 1989).

Inadequate regulation

Although excessive land regulation has constrained the supply of land in some developing country cities, inadequate

regulatory frameworks and weak enforcement are major factors contributing to the occupation of hazard-prone areas in other cities. Many developing countries generally lack appropriate building codes for construction in hazard-prone areas. Also, few trained professionals are available in developing countries to prepare plans and formulate appropriate development regulations.

In some situations, although local authorities may design appropriate regulations, they are improperly implemented and enforced. In Izmir, Turkey, for example, engineers and planners have taken steps to incorporate risks of natural hazards (that is, earthquakes, landslides, and flooding) into the planning process. Some areas that are potentially subject to earthquakes have building restrictions forbidding construction of commercial or high-density structures. Other areas subject to high risk of landslides have been determined as unsuitable for any construction and are to be used only for open space. National construction standards are in place in earthquake-prone areas as well. Nonetheless, there is no requirement for all structures to be reviewed for compliance with standards as part of the construction permit process (World Bank 1989).

Land use laws in other cities forbid development in hazardous areas, but they are inadequately enforced either because the city cannot afford to hire inspectors or because those employed are so poorly paid that they are susceptible to bribes. Moreover, stopping the poor from building on these locations is difficult because they cannot afford to live elsewhere. Many cities have inadequate resources and policies for providing low-income households with alternative housing. In some cities, as soon as the authorities have resettled households elsewhere, other migrants quickly take their places (World Bank 1991).

In Morocco, laws restricting development in hazardous areas have actually encouraged low-income people to occupy these areas. The government declared certain portions of Rabat off limits for permanent housing because they were situated on the steep slopes and adjacent

salt marshes bordering the river that divides Rabat and Sale. Since lands could not be used for "higher" purposes, the regulation essentially directed squatters right to them. Because permanent housing was outlawed, the normal progression from unstable shacks to improved and more habitable structures was actually prevented (Baross 1983).

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 hazard-prone areas have not been established. Although many 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. Numerous codes, ordinances, and other instruments have been adopted that were used in developed countries with totally different land and construction conditions. They are also generally formulated without having consulted with public or private interests and therefore lack political acceptance and adequate incentives to prevent environmentally inappropriate land conversion or development. These land use plans, as well as the accompanying controls, are often unrealistic and unenforceable due in large part to the low priority given them.

Inadequate information

In most developing countries, the inadequacy of information on the land and environment poses a severe constraint on land market transactions, as well as land use and environmental planning, property taxation, resource management, and hazard mitigation—all of which are directly related to the occupation of hazard-prone areas. More information is needed on parcel-based land (land ownership, land values, land use), the environment (ambient environmental quality, waste management practices); health conditions: housing conditions; and natural hazards and associated risks.

Parcel-based land information

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, since 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 needed to clarify ownership delay real estate transactions considerably. In Accra, for example, conflicting customary and modern systems of titling and land registration have resulted in 16,000 legal claims over disputed properties. Subsequent litigation has forced land development on the fringe of Accra to halt (Acquaye 1989, cited in Dowall and Clark 1991). Consequently, the time and costs involved in resolving disputes and obtaining clear title lead many to obtain land and housing through the informal sector. In many cases, informal housing subdivisions are located on hazard-prone lands on the peripheries of cities.

Inadequate tax rolls or fiscal cadastres also have direct implications on financing urban infrastructure and thus for expanding the supply of serviced land in the formal market. Not only is the number of recorded properties low, but the assessments are usually out of date and reduced by inflation. These inadequate fiscal records, in addition to outdated land assessments and poor collection performance, result in property tax revenues that are only a fraction of municipal revenues. In the cities of most developing countries, the urban poor are the group most often not provided urban services. Lack of financial resources also means that the existing infrastructure cannot be maintained properly, thus increasing the vulnerability of lands in hazard-prone areas.

Land use and environmental data

Without key land use and environmental information on the land resources to be

managed, local authorities find it extremely difficult to establish effective regulations and policies that affect hazard-prone areas. At a minimum, information is needed on existing land use and density; waste management practices (that is, solid and hazardous wastes, sanitation, industrial pollution); locations and capacities of existing utilities and services; local health conditions; natural hazards; land conversion rates; and economic and social characteristics of local populations and activities. Most countries lack enough accurate, timely data—as well as the capability to interpret the data—on many of the above, which inhibits the formulation, application, and enforcement of land management schemes, as well as broader environmental management strategies. Lack of such baseline data also undermines adequate environmental assessment of a proposed development project to be located on or adjacent to hazard-prone areas.

Lack of tenure security

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 has profoundly affected the ability of the poor to acquire safe land for housing. A major implication of a poor titling and land registration system is the inability of landowners to gain access to formal sources of credit 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. Studies on informal settlements find that as security of tenure increases, households invest more resources in upgrading their residences (Dowall and Clark 1991).

Inadequate taxation

The lack of adequate tax policies and systems has contributed to a shortage of serviced urban land. For example, ineffective tax policies perpetuate the holding of vacant or underutilized land that could otherwise be converted for higher-density urban development. Low property taxes not only subsidize the landowner, but they enable landowners to tie up parcels of land unproductively at relatively low cost to themselves. Due to inadequate taxation systems, most cities in developing countries also have insufficient financial resources to finance infrastructure or improve land titling and registration systems. As discussed above, the property tax system in most developing countries is undermined by poor coverage, out-of-date property assessments, and inadequate collection and enforcement systems. Also, 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.

Land management strategies for hazard-prone areas

Ideally, the management of hazard-prone areas should be carried out within the context of an overall land and environmental management plan for the metropolitan area, coastal zone management program, or integrated hazards management plan. Under any of these schemes, it will be necessary to carry out a comprehensive assessment of hazard-prone areas (covering both natural and socioeconomic conditions), formulate urban land management objectives that relate to hazard-prone areas, and then identify appropriate land management strategies and instruments.

Land management objectives and strategies

Many land management objectives call for improvement of land markets as well as resource protection. Typical land policy

objectives include increasing the supply of affordable serviced land for low-income populations, increasing efficiency and equity in land allocation, and releasing urban land from such constraints as excessive zoning restrictions. By contrast, the objectives of environmental protection aim to maintain and protect environmental resources, services, and ecological processes; protect natural plant and animal habitats; manage multiple uses; protect environmentally sensitive areas; and encourage public awareness of the need for using natural resources wisely. Although policies and actions to meet each set of objectives may overlap, some approaches may conflict with each other.

To meet environmental objectives, one approach places special restrictions on land vulnerable to natural and human-caused hazards. As discussed above, however, imposing such restrictions can have negative repercussions for the urban poor. Restricting development on such land will place additional constraints on the supply of land available for urban development and thus increase its price. Unless the government provides alternative sites for low-income development, placing development restrictions on hazard-prone land will further constrain an already limited supply of land and push illegal settlements further away from employment opportunities and urban services.

To accommodate the needs of low-income populations, another approach to managing hazard-prone lands restricts development in designated areas, but provides alternative safe sites for development. Urban land management authorities would service alternative sites in desirable locations and/or increase allowable densities in existing urban areas. In some cases, relocating existing land occupants to alternative sites may be necessary, as well as providing appropriate compensation. Alternatively, local authorities could allow development of some hazard-prone areas, but require or provide appropriate infrastructure and building materials that would mitigate the negative effects in the event of an emergency. In some cases, dedicating hazard-prone areas for special uses may be necessary. For example, hazard-

prone areas can be designated as parks or protected areas, which the local community could enjoy. Designating such areas, however, should involve public expenditures for establishing and enforcing the necessary management controls, as well as providing alternative housing sites.

In most instances, managing hazard-prone areas will require a broader approach to urban and environmental management in a particular city or 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 half 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 infrastructure improvements (including sanitation and drainage), as well as improvements in the management of urban services, local fiscal resource mobilization, and urban management capacity. (See *Benin Floods and Bank Response: The Case of Cotonou* in this volume.)

Evaluating costs and benefits

In formulating strategies for hazard-prone areas, land managers need to evaluate the benefits and costs of each alternative—to both the government and the poor. From the perspective of the government, for example, 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 to provide emergency relief and alternative housing and supplies in the event of a disaster. The costs of these restrictions, however, may include the direct expenditures for establishing and maintaining special controls over hazard-prone areas or for making alternative land available for low-income housing.

Allowing development in hazard-prone areas imposes a different set of benefit and

cost considerations. As mentioned above, allowing development in some vulnerable areas may require public investment in appropriate infrastructure to withstand hazards (for example, appropriate drainage systems). If the local authorities allow development in hazard-prone areas without the necessary mitigation measures, however, the government as well as the occupants, may be faced with many lost lives, destroyed property and infrastructure, as well as the necessary expenditures for providing alternative shelter, food, health care, and other services in the event of a disaster.

The evaluation of costs and benefits in formulating land management strategies for hazard-prone areas should involve national and local actors and should take into account the nature, severity, and frequency of existing or potential hazards. Once land management objectives and strategies are identified, the next challenge is to select locally appropriate land management instruments that can achieve a proper balance between land efficiency and equity as well as the protection of urban populations.

Selecting appropriate land management instruments

Managing hazard-prone areas requires a mix of appropriate policies and instruments. Some of these instruments will influence market behavior (for example, increasing supply by removing excessive land use controls or improving land titling systems); others will affect the land management process through improved regulation, subsidies for infrastructure, or provision of critical land information. The array of instruments available for managing development in hazard-prone areas fall into six basic categories:

Regulatory approaches. These include zoning, subdivision regulations, and building codes, all designed to protect land resources urban populations.

Economic instruments. These include economic incentives such as preferential taxation schemes, transfer and development taxes, and grants, all of which can be used to encourage

developers and landowners to develop (or keep in natural state) hazard-prone land in accordance with environmental objectives.

Property rights. This approach involves the provision of secure land tenure to promote investment in housing and infrastructure improvements.

Acquisition strategies. These include various types of land acquisition approaches, such as voluntary sales, expropriation, easements, and land exchanges, that will enable urban land managers to either restrict development in hazard-prone areas or ensure that adequate infrastructure provision and other measures are taken to protect vulnerable populations and resources.

Government provision of infrastructure. This approach involves the provision of appropriate infrastructure (for example, roads, water and sanitation, drainage) to guide development as well as to serve the special needs of hazard-prone areas.

Information/educational approaches. These include methods for expanding public knowledge of the issues, land conditions, and environmental implications of various types of development on hazard-prone lands. These approaches can be used to support land use decisions and to encourage landowners and public authorities to carry out voluntary conservation. They include land titling and land information systems, various types of assessments (e.g., environmental impact, land market, hazard), and public information programs.

Local authorities 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 instruments, they must 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 land area requiring special management. In

addition, urban land managers need to take the following factors into account:

Local attitudes and interests. What are the social and cultural values of the population? Do public authorities want to protect vulnerable populations or are they more concerned about other local priorities?

Legal authorities. Do the existing local land management agencies have sufficient authority for implementing and enforcing the chosen approaches?

Institutional capacities. Are there sufficient financial, technical, and managerial capacities to 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 the 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 infrastructure costs. 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 other activities (for example, employment or transportation)?

Adaptability. Does the instrument ensure that the urban pattern can adapt and change over time as new pressures of population growth and economic activity arise (for example, to allow expansion of activities and services as needs arise)?

Conflict resolution. Is there a system for mediating and resolving conflicts between

competing objectives at one level and competing uses at another?

Political constraints. Are the selected approaches politically feasible? What is the commitment of key decision-makers, as well as the checking mechanism or opposition parties, the mass media, and citizen groups?

All these factors need to be addressed in determining the appropriate mix of instru-

ments. The remainder of this paper discusses in more detail the principal land management instruments that can be used to protect urban populations from location-related hazards. (See Box 6.1 for information on a joint project carried out by the World Bank and two United Nations agencies to address the need for appropriate management instruments.)

Box 6.1. Joint Urban Management Program of the United Nations Development Programme, the World Bank, and the United Nations Centre for Human Settlements

Carl Bartone

An emerging urban crisis in developing countries is characterized by growing urban poverty, poor urban policy and management, and a deteriorating urban environment, which together threaten to disrupt economic growth. Solving this urban crisis is a priority for development. Sustainable cities require the management of the urban environment and an understanding of the linkages between productivity, poverty, and environmental health.

In response to this challenge, the World Bank, the United Nations Development Programme (UNDP), and the United Nations Centre for Human Settlements (UNCHS) have joined forces with the donor community and developing countries in a cooperative Urban Management Program (UMP). UMP's aim is to develop and promote appropriate policies and tools for urban environmental management, land management, infrastructure development, municipal finance and administration, and poverty reduction. The program stresses capacity building through a partnership with national, regional, and global networks and with donors in applied research and the dissemination of information and on the best practices and promising solutions from experience.

The project will publish its recommendations in a report, *Environmental Strategies for Cities*, to appear in 1992. The report will be aimed at policymakers, planners, and managers in developing countries who are responsible for urban development and for providing infrastructural and environmental services. The report will also provide guidance to donors supporting urban projects and to national and international consultants engaged in project preparation. Urban researchers should also find it useful for establishing an urban environmental research agenda.

Alternative instruments for managing occupation of hazard-prone lands

As discussed earlier, six categories of instruments can be used by urban land authorities to manage hazard-prone areas. Ways in which individual tools within each category can be applied to hazard-prone areas are summarized below. The following instruments, however, do not necessarily cover the full range of possible options. Rather, they represent the most commonly used approaches by both developing and developed countries.

Regulatory approaches

Zoning

Zoning is 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 permitted. Zoning also establishes the height and bulk of buildings and other structures, minimum allowable lot sizes, minimum setback from property lines, and population density. By controlling the use of land as well as the density of various land

uses, 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 land management instrument because it permits the community to exclude many uses altogether. Specific types of zoning that are particularly relevant to managing occupation of hazard-prone areas are briefly described below.

Floodplain zoning. Floodplain zoning regulations control uses of land within hydrologically defined areas subject to floods of a designated frequency. Essentially, they establish a flood setback rule for most development. In the United States, the impetus for most local floodplain zoning ordinances was the National Flood Insurance Program; most floodplain zoning is consistent with its regulations.

Performance zoning. Performance zoning allows flexibility in design as long as certain standards are met. It can be applied to residential development, industrial zones, and hazard-prone areas among others. To protect development in hazard-prone areas, for example, a locality could require a developer to conduct a hazard or risk analysis so as to avoid certain types of development in vulnerable areas. 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 of the tract, leaving other areas in natural cover. Their effectiveness 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 can impose special restrictions (for example, requirements for setbacks) and designate permitted uses for hazard-prone areas.

In developing countries, land use controls have the best chance for success if the areas to be restricted are relatively small, if the problems are clearly identified, if the public is

supportive, and if there is capacity for adequate enforcement. Generally, zoning has been ineffective 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. Moreover, where land use controls significantly limit the location and supply of residential land, for example, zoning becomes a major source of inflation in housing costs (Mekvichai 1991).

In restricting land use, 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. If land will be restricted, there must be alternative sites or increases in allowable density in other sites located near employment or provide transport. If occupants of hazard-prone areas are relocated to alternative sites, however, special measures (for example, fence construction, police monitoring, and enforcement action) must be taken to ensure that new groups of squatters or low-income settlements do not replace them.

Land use controls can be effective, but they are negative. They prevent landowners and households from acting freely on the land they control. Moreover, they require a sophisticated, well-trained bureaucracy with a strong enforcement arm to operate effectively. Hence, local officials in developing countries rarely use zoning effectively. Few can afford the elaborate enforcement system (that is, inspectors, officials with police powers, and judicial bodies to resolve disputes) to make these controls work effectively (Kitay 1985).

Subdivision regulations

Subdivision regulations are locally adopted laws governing the process of converting raw land into building sites. Such laws control the physical layout of new developments by establishing standards for 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 land until the plat (detailed map) of the proposed subdivision is approved by the planning authority.

Regulation and planning of subdivisions is used extensively in developing countries. In many cities, planning authorities may take 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 of meeting minimum standards, costs in time and labor to obtain the necessary titles and permits, and informal payment costs where laws are imprecise. All these costs, however, fall mainly on the poor. For example, minimum plot size increases the costs for households that would normally have chosen a smaller plot size than that mandated by the regulations. In Jakarta, for example, the minimum legal standards for a dwelling unit raise the minimum cost of about Rp 4 million per unit. By establishing minimum standards, the law implicitly establishes a *de facto* "minimum standard income." If households fall below this minimum standard income, they will have to obtain shelter through the informal sector, and thus forego a number of benefits reserved for the formal sector (for example, access to housing finance). In this way, poor households are made to 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 thus lose the benefits of the formal sector (Bertaud 1989).

Building regulations

Building codes regulate the materials used for constructing new buildings, as well as the manner in which they are constructed. They must be codified or written into deeds or other instruments and may be statutory or contractual. They include restrictions against erecting certain structures, and restrictions on the style of architecture, cost of the structure,

materials, position of a building on a lot or its distance from the street, height or depth of a building, and the use of a building. Building regulations are one of the oldest and most common method of controlling land development. They address fire protection, structural safety, resistance to natural disasters, sanitation, and esthetic considerations.

Building regulations are an important means of controlling losses from floods, tropical cyclones, and other natural hazards which imply added loads for the structure. Building regulations that prevent earthquake damage, however, are not necessarily the same as those that afford protection from tropical cyclones or floods. Incorporating standards for withstanding hazard-induced stress into building regulations usually augments construction costs, although experience shows that simple precautions can be effective. For example, such simple preventive measures as anchoring roofs securely to buildings or installing strong shutters for glass windows can considerably reduce damage from tropical cyclones. In Latin America, the use of building regulations to mitigate the effects of natural disasters seems to be growing, most 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 being promoted. In 1982, the Caribbean Community Secretariat, with assistance from other organizations, developed a Caribbean Uniform Building Code to reduce damages from tropical cyclones (ECLAC 1990).

The imposition of building regulations often has been responsible for raising building costs and widening the gulf between what the consumer can and must pay for rent. Every regulation that raises costs, unless compensated by a rise in real income or subsidies, removes another segment of the population from the group that can afford to own a house (Courtney 1983). In many developing countries, land use regulations, planning, and building standards constrain the access of low-income groups to land. While these regulations attempt to ensure citizen health, safety, and welfare by strictly

controlling building and land development standards, they force the very groups they seek to protect into the completely unregulated informal sector. The solution is to design land development standards that address both externalities and housing affordability concerns (Dowall and Clark 1991).

Environmental controls

National, state, and local controls on air and water pollution, and on solid and hazardous waste should restrict the discharge of pollutants and solid and hazardous wastes into the environment. The effective design, implementation, and enforcement of these controls are essential to protect urban populations that may be located on lands near industrial facilities. Because these controls are not land management instruments per se, they lie beyond the scope of this paper.¹ Nonetheless, several local government environmental controls can directly affect urban land use.

Shoreline exclusion or restrictions.

Shoreline exclusion or restrictions refers to regulatory programs that prohibit or significantly limit certain uses within a strip in the coastal zone. The areas subject to shoreline restriction are typically landward of the high water mark. They are rarely in the intertidal zone or submerged lands because the national government usually controls these areas under separate mandates. Although most shoreline exclusion strategies in developing countries arise from concerns over public access, degradation of views, and erosion of shorelines, such strategies can also be used to limit residential and tourist development in areas at high risk of deaths and property losses from natural disasters—especially hurricanes, cyclones, tsunamis, and certain types of soil liquefaction, land sinkage, and landslides. In some cases, exclusion zones and land use planning boundaries for permit letting can be mutually supportive and may be integrated into a single program. Shoreline exclusion zones differ from critical area management programs in that they are coastwide and carry no special designation declaring the uniqueness of

particular types of areas (Sorensen and McCreary 1990).

Many countries have adopted the concept of public ownership along the shoreline. In Latin America, at least eight countries apply the concept of a public zone: Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Uruguay, and Venezuela. Each of these countries has established shoreland zones based on a specific setback from the shoreline (usually mean tide). There is considerable variation, however, in the width of the zone as well as differences in both the allowable uses and the extent to which the government plans and manages the area.

According to Sorensen, Costa Rica appears to have the most ambitious and comprehensive shoreland restriction program in the world. Under this program, the jurisdictional area 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.

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 an alarming rate, exclusion or restriction zones are a convenient way to impose a moratorium on development until a more comprehensive land use plan can be prepared and implemented (Sorensen and McCreary 1990).

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 native private 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 to be effective. Exclusion programs alone leave large gaps in the national effort to achieve integrated coastal management.

Critical area protection. Critical area protection programs can be established by local, provincial, or national governments 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, apply to specific geographic locations, 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.

Critical area management shows promise as a technique to help developing countries avoid the consequences of urbanization in flood plains. It enables a government to concentrate funds and staff resources on the most threatened or hazard-prone areas. Because many designated areas may incorporate 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, although it is likely to be more comprehensive than acquisition alone because critical area protection usually has both a land use regulatory program and rules for guiding human activities within the area. A critical area designation could, however, become the focus of intense political controversy (Sorensen and McCreary 1990).

Permits

Issuance of permits is an integral component of many types of land and environmental management strategies. For example, land use planning, shoreland exclusion, critical area protection, and environmental impact assessment are all undertaken to provide government units with policies and information for making decisions on the issuance of the permits that are required (usually by law) before proposed development actions can proceed to construction or implementation. 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 have permitting authority to ensure that its decisions are adequately implemented. The potential for adequately implementing a management strategy, therefore, is greatly increased if the governmental unit also has the authority to issue permits to enforce its decisions (Sorensen and McCreary 1990).
