5.2 Land-use planning

"Land-use planning is not a simple linear process; it is complex and subject to considerable pressure, including possible court action. The land-use planning process takes place in a political context. Developers, local government, local communities, State and Federal Governments all influence land-use outcomes. The process calls for wide community consultation while being developed, as well as continual monitoring and review throughout the life of the plan. Strategic land-use planning is therefore an iterative and evolutionary process."

Emergency Management Australia, 2002

There is a need in disaster risk management to recognize the relationships between population growth, the physical demands of human settlement, economics planning and the most appropriate use of available land.

The application of informed and consistent planning practices is crucial to minimize the potential loss of physical assets and environmental capital. These practices include the use of both tools and guiding documents. Master plans, development plans, water management plans, recreation plans, tourism plans, as well as other planning instruments such as detailed land-use or subdivision plans and zoning by-laws, are examples.

The landscape itself must be treated as a valued resource in managing risk. Failure to act on this principle is to invite disaster.

Both the opportunities and the difficulties of employing land-use and planning practices for disaster risk reduction are reviewed in this section which includes:

- *the importance and difficulty of land-use planning;*
- *a delicate balance and measured benefits; and*
- *case examples.*

The importance and difficulty of land-use planning

Land-use planning that is carefully designed and rigorously implemented is the most useful approach to managing urban or population growth and minimizing associated risks. It is also one of the most challenging to implement because of conflicting values held about land by different segments of the population.

In many societies, cultural, social or economic attributes associated with land can form the basis of some of the most contentious issues among people, particularly at local levels. Reference has already been made in the preface of this review to the economic attractions that flood plains or volcanic slopes hold for inhabitants. In other countries wetlands are drained to become industrial parks or housing estates.

Deciding how to use land is demanding enough. It is even more daunting if there are competing views about the role that land should play in reducing collective exposure to risk. Considerations invariably revolve around whose land it is, whose risk is involved most emphatically and who is to benefit. Too often, the desire for short-term gains override anticipated benefits that stretch further into the future.

For these reasons, land-use management and related regional and territorial planning, have to be considered as natural extensions of conducting hazard assessments and risk mapping. They must take account of the spatial parameters of physical vulnerability considered in accordance with the broader social, economic and environmental requirements of a society.

Such forms of planning used to be considered primarily as technical exercises but planners and local political authorities are now realizing that members of affected communities have to be widely consulted and involved throughout the process.

Account also needs to be taken of neighbouring or adjacent communities, which are not always of the same country, kinship or socio-economic standing. Actions taken by one group of people living along a river or in the upper areas of watersheds, can have a significant bearing on diminishing the fortunes or increasing the risks of others who live on the opposite shore or downstream.

Government authorities need to play a role in the judicious assessment of such relative merits but there is equally a requirement for popular involvement. The informed participation of the public is essential in the development of municipal or territorial standards and the acceptance of regulatory practices.

A failure on the part of government to implement effective land-use and planning practices is untenable. As one commentator has observed, while long a function of local governments, land-use planning regrettably has often been done with little regard for exposure to risk. Consequently, inadequate, ill-informed or non-existent land-use planning has contributed to increasing the vulnerability of communities exposed to hazards.

Box 5.16
Planning safer communities in Australia

In 2002, Emergency Management Australia (EMA) published Planning Safer Communities: land use planning for natural hazards, as part of its Australian Emergency Manuals Series. The manual consists of five main sections:

- Natural hazards and disasters;
- Managing risk;
- Strategic planning and the performance-based approach;
- The role of land-use planning; and
- Integrating risk reduction into the land-use planning process.

These guidelines have been developed to demonstrate how integrated land-use planning can be used to reduce the impact of natural hazards. The focus is on risk reduction at the interface between communities and the natural environment, and integrating risk reduction into the land-use planning process. The target groups for these guidelines are local government planners and planning practitioners, emergency managers, and people concerned with community safety.

Source: Planning Safer Communities: land use planning for natural hazards, Emergency Management Australia, 2002.

Lacking formal planning, a community adopts informal ways of planning, which may or may not be effective. However, at a large scale, formal planning is essential and often there is a gap or disconnection between the formal and informal planning systems. Landslides that destroyed a housing development in the city of Santa Tecla, El Salvador following the January 2001 earthquake, represent one such example. Most likely, there are hundreds more examples in other countries.

A delicate balance and measured benefits

Land-use management and planning practices that reduce disaster risks are part of larger risk scenarios, best considered in local community contexts.

Regulatory approaches which emphasize land-use planning to reduce future flood disasters have proved effective in some countries with advanced economies, but evaluations reveal that they too are being weakened in numerous ways. This in turn is leading to calls for refinements in regulatory strategies.

Unfortunately, regulatory approaches are much less effective in developing countries with the growth of mega-cities. Many people have inadequate housing and basic services and with a rising tide of migrants also come unmanaged, informal economies. Ironically, it is in such places where planning has the greatest chance to reduce vulnerability.

Some hazard-specific examples with regard to land-use planning follow.

Earthquakes, volcanic eruptions and avalanches

Seismic micro-zoning enables identification of earthquake-prone areas at a local scale. This can be used to maintain low levels of building density or to avoid development in such areas. Micro-zoning has proved to be particularly effective in establishing setback distances from active fault lines within which building is prohibited.

Risk arising from volcanic eruptions also can be reduced substantially by means of controlling the type of development in potentially hazardous

Box 5.17
Principles of land-use management and urban planning for risk reduction

The following principles apply to land-use management in the context of risk reduction strategies.

Land-use management plans form a shared basis for sustainable development and risk reduction strategies:
- As the physical and spatial projection of the social, economic, environmental and cultural policies of a country, land-use management includes various planning tools and management mechanisms.
- They are necessary for a productive but sustainable use of the national territory and provide for the successful regulation of the economic life of a country.

Land-use management operates at different geographical scales which require different ranges of management tools and operational mechanisms:
- At the national level, sectoral economic policies are tied into the administrative framework of provincial or territorial jurisdictions.
- At the metropolitan level, strategic plans are formulated for sustainable urban development.
- At the municipal level, municipal ordinances and regulatory plans define local land-use management practices.
- At the local or community level, plans encourage participatory management for community works and urban projects.

Land-use management involves legal, technical, and social dimensions:
- The legal and regulatory dimension includes laws, decrees, ordinances and other regulations adopted by national and local governments.
- The technical and instrumental dimension includes planning tools and instruments that regulate uses of land and strive for the best balance between private interests and the public good.
- The social and institutional dimension includes those mechanisms which include citizen participation in land-use management practices, such as consultations, public hearings, open municipal sessions and plebiscites.

Land-use management encompasses integral services and individual sectoral interests:
- Integral or dominant issues revolve around the provision of essential services or related infrastructure, such as water, energy, transportation, communication – and as now recognized, risk management.
- Individual sectoral issues include housing, health, education, agriculture, natural resources, the economy and trade.

The practice of land-use management proceeds through three stages:
- Strategic planning
- Administration and fiscal control
- Follow-up and monitoring

Successful land-use management plans will confront challenges:
- Tensions or vested interests between government and private interests, national and local interests or instruments of the state and the population can occur.
- Dynamic factors such as population growth, migration, conflicts over the use, supply or demand of services will occur.
- There will be factors specific to risk management including the changing nature of vulnerability, major fluctuations in land values, urban services and environmental services.

Successful strategic land-use management requires essential resources:
- A clear legal and regulatory framework defines the competencies of the various stakeholders and the role of each actor in the various stages of planning.
- Access to information about regulatory plans, land and property markets, public and private investment projects is crucial for ensuring effective citizen participation in decision making.
- A decentralized fiscal policy strengthens the capacity of local governments to raise revenue and to consolidate their finances in the interest of effective local administration.

Source: UN-HABITAT, 2000.`

areas. In this sense, volcanic hazard mapping provides the basis for land-use regulations as well as critical information for developing effective evacuation plans.

Some countries have well established zoning regulations for mass movement hazards such as landslides and avalanches. This is the case for Switzerland where a three colour zoning system guides the development of both public and private buildings. The Swiss code subsequently has been applied in many other parts of the world.

Box 5.18
Land use in the United States

In many counties and cities in California, United States, setback ordinances are used to enforce seismic safety. Thus, building and stability slope setbacks can be recommended where proposed developments cross known or inferred faults, as well as where active landslides or old landslide deposits have been identified.

Setbacks can also be used to impose appropriate separation of buildings from each other to reduce pounding effects. This phenomenon is most common in urban areas where structures of different heights, resulting from different constructions methods, are combined in close proximity. Another type of setback regulates the distance from buildings to sidewalks or other areas that are heavily used by pedestrians. The main purpose of such setbacks is to reduce the loss of life and injury arising from collapsing buildings during an earthquake.

Source: adapted from K. Smith, 1996.

Box 5.19
Land use in Switzerland

According to the Swiss federal law for land-use planning, cantons must identify in their master plan all areas that are threatened by natural hazards. The master plan is a basic document for land-use planning, infrastructure coordination and accident prevention that allows for early detection of conflicts between land use, development and natural hazards.

In order to guarantee a uniform means of assessment of natural hazards in Switzerland charts describing various degrees of danger are used, based on hazard maps. Two major parameters are used to classify the danger – the intensity and the probability. The estimated danger has implications for land use. A description of the magnitude of damage that could be caused by an event is based on the identification of threshold values for degrees of danger, according to possible damage to property. The danger zones can be delineated on the local plan together with areas suitable for construction or zones where additional protection is required.

Three degrees of danger are defined and are represented by the colours red, blue and yellow. They indicate the level of danger to people, animals and property. The degrees of danger are initially assigned according to their consequences for construction activity: areas where buildings are not allowed are red, indicating a high hazard; areas where building must follow safety requirements are blue, indicating a potential hazard; and areas without building restrictions are yellow.

Source: O. Lateltin and H. Raetzo, 2001.

Floods

Flood management strategies are constantly being rethought. One approach draws on experience in traditional societies that seek to adapt flood conditions. Techniques include building stilt houses as is done in Malaysia. There are also effective social measures such as mutual aid responsibilities that are a part of strong kinship relationships that often exist within local communities.

Elsewhere, other strategies are characterized by responding to flood conditions, either by means of accommodation or protection. Engineering solutions and physical or structural defences are increasingly being supplemented by the consideration of environmental strategies, such as the use of mangroves or wetlands that act as natural defences.

Modern strategies reflect a perspective of sustainability and emphasize the wiser use of flood plains and coastal flood zones. Such outlooks are motivated by the anticipation of risks: empowering local communities to make choices, promoting disaster resilience, improving local and socio-economic adaptive capacities, and encourage wider public participation.

Nations or communities successful in their approaches to reducing flood losses strike a balance between the potential consequences of flood risks and the value of other beneficial socio-economic goals. They make informed decisions based on sound information, encouraging self-help and self-reliance. Successful communities embrace traditional mitigation methods as well as new technologies that will increase resilience.

Case: Cuba

In Cuba, national land-use planning and management are truly integrated into risk reduction considerations. For over 40 years, the Institute for Physical and Spatial Planning has been the responsible body for the implementation of physical planning in the country.

Its planning system integrates all scales of political and administrative jurisdictions in addressing a wide range of land-use issues. These include the

management of natural resources, decisions about human settlements, the environment, hazards, vulnerability and risk.

The institute defines regulations and provides methodologies for risk management that include building codes and risk zoning to reduce the physical vulnerability of households and critical infrastructure, especially in flood-prone areas.

These and related tools for implementing land-use controls across the country are supported by well-integrated methodological and legal frameworks tied into the sustainable development processes of the country. In addition to the institute, the national civil defence authority and the hydrometeorological service are other key organizations in realizing these strategies.

Two main mechanisms are used to implement land-use policies. The first is a series of planning tools that include land-use schemes applied at the national, provincial and municipal level. Plans for territorial and urban planning are formulated by provincial and municipal authorities. Once approved, these become legal instruments that regulate land use for public and private landholders. They are supplemented by feasibility or location studies, or other forms of detailed studies conducted to meet specific requirements.

The second mechanism consists of regulations and management practices. These include directives for the allocation of investments and provision of guidance for building investments according to land-use criteria. The consideration of physical vulnerability and environmental impact assessments are incorporated at this stage of planning.

As in other island states, coastal areas constitute the most fragile and complex ecosystems in Cuba. Their increasing exposure to the impact of natural disasters has motivated the government to support studies on land-use management.

At the national level, schemes define guidelines for the use of coastal areas, identifying priority scenarios for which higher resolution studies would need to be conducted. A hazard map for storm surges and additional vulnerability maps have been produced.

The use of these maps allows relative levels of risk to be identified for settlements located in coastal areas. Several land-use regulations have resulted from this study, including specific recommendations for retrofitting, resettlement and urban growth regulations for 107 coastal settlements.

A comprehensive study also has been conducted in Havana province, following analysis conducted in 1998 that revealed deficiencies in land-use management. By working with the government, UNESCO contributed to this study, in which vulnerability reduction was one of the main goals.

The implementation of related activities is proceeding over time, with financial commitments from both the government and the local population. The communities have participated in different stages of the project, becoming more familiar with the issues of vulnerability and principles of disaster reduction. In order to reduce disaster risk for coastal settlements in this area, the following recommendations have been made.

Direct measures that:
- Prohibit the construction of vacation houses in existing settlements.
- Relocate the population vulnerable to disasters.
- Regulate and supervise the construction of new homes in the settlements.
- Retrofit and build homes adapted to flood conditions.
- Improve the drainage systems in and around the settlements.
- Improve potable water supplies and sanitation systems.
- Improve health and transportation services.
- Create employment opportunities.

Indirect measures that:
- Improve the natural resilience of beaches.
- Improve the water irrigation systems near the coast.
- Rehabilitate the wetlands.

The city of Havana provides an example of urban planning in a coastal zone. The city has a conspicuous breaker wall or *malecon*, stretching 7 kilometres along the sea, to reduce the impact of storm surges that periodically strike the city's coast. Inappropriate urban growth is reflected by the private houses and installations that have been built in the vicinity that is a high risk area.

A plan approved by the Administration Council of Havana in 1995 is now applied to all urban planning projects in this area. Because of the

vulnerability zoning implemented through this plan, codes and standards for construction have been renewed. They aim to improve the organizational procedures, engage more effective means of construction, and promote sound rehabilitation in the area. Basements have been rebuilt, the heights of buildings regulated, and new landscape designs for public areas adopted.

Land-use management and urban planning in Cuba are economically and technically feasible tools for disaster reduction. Initiatives in land-use management and urban planning have involved communities in the identification of local problems, in the planning process and in implementing the decisions taken about land-use management. Revised legislation on disaster reduction based on new methodologies has been applied, contributing to more effective implementation of disaster risk management activities.

The multidisciplinary and inter-institutional nature of the work has helped to establish a conceptual and more methodical basis for effective disaster risk reduction. As the responsible body for disaster mitigation and relief activities in Cuba, the Civil Defence Service has benefited greatly by a broader understanding of land-use tools and their role in disaster risk reduction. Principles regarding land-use and urban planning derived from the Cuban experience appear in Box 5.20.

Case: Nicaragua

In Nicaragua during 2001-2002, more than 20 municipalities were provided with tools for risk management, with a special emphasis on land-use planning. These included the preparation of hazard maps, land-use zoning proposals and municipal disaster reduction plans. They also identified specific measures to reduce the risk of communities, considered particularly vulnerable by both local and national authorities.

National professionals who received special training developed these tools by working in a participatory manner. The project was developed in Nicaragua with the support of the Swiss Agency for Development and Cooperation (SDC).

Methods used to produce a municipal study were thorough, scientific and comprised multiple-hazard and multiple-risk analyses of the whole study area, taking account of local knowledge and specialized information. The core of the methodology is the elaboration of the municipal disaster reduction plan that involves the production of different risk management tools. Figure 5.1 illustrates the methodology used for such municipality studies.

Case: France

The Plan for the Prevention against Natural Risks (PPR) is the main tool in the French national disaster risk reduction strategy. It aims at controlling the use of natural and rural spaces and acknowledges a responsibility to inform citizens about the risks to which they may be exposed. Citizens are able to familiarize themselves with the importance of risks, take measures to protect their housing and join authorities in establishing relief and evacuation plans.

The primary objective of the PPR process is to analyse the risks of a particular territory in order to establish hazardous areas. Resulting plans are then able to introduce appropriate measures of urban planning and construction that take account of effective risk management practices. Zoning is one of the most common tools used once hazards have been locally situated.

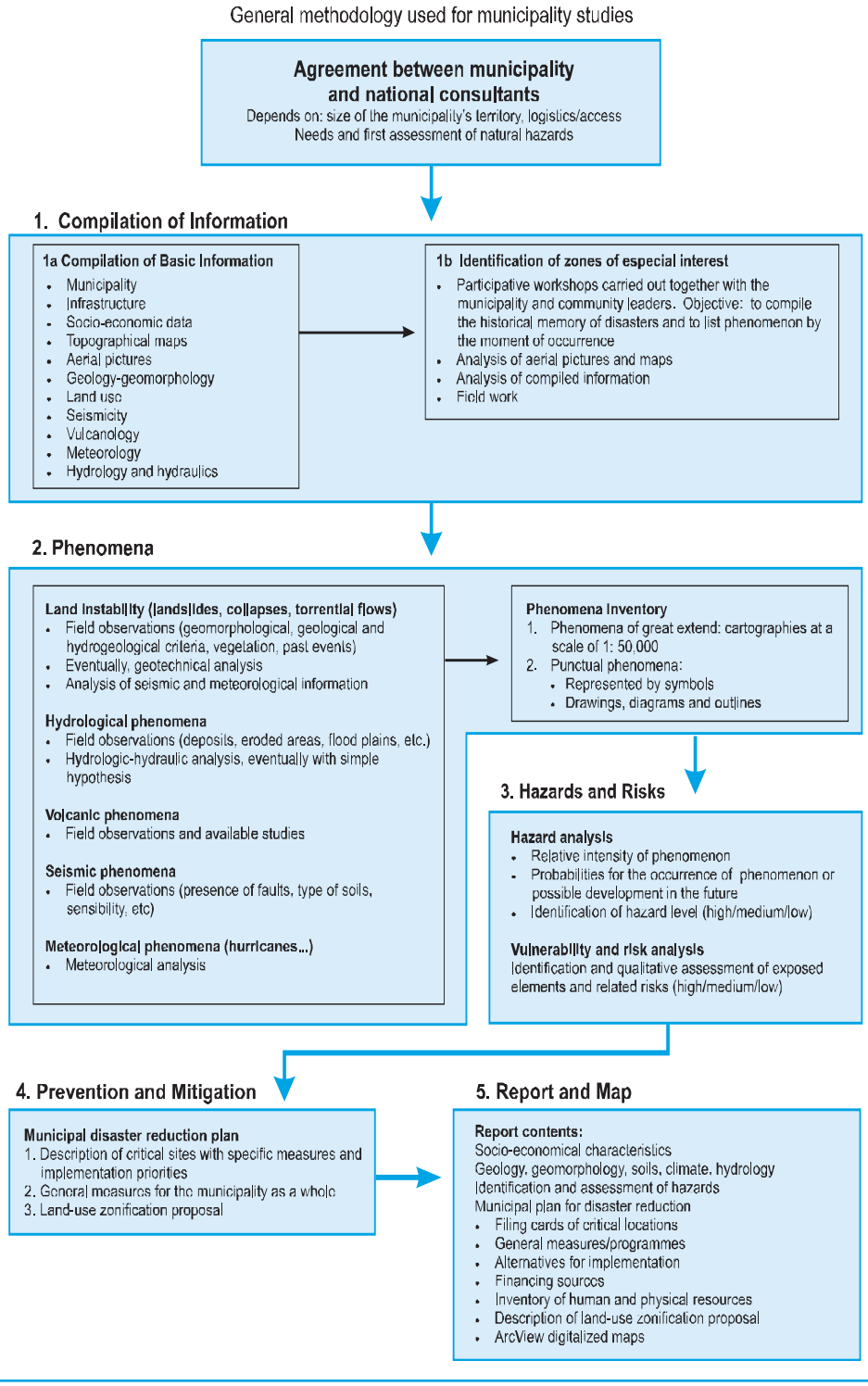
Resulting risk maps form the basis of consideration that leads to the implementation of PPR and related legislation. PPR is elaborated by state agencies and is implemented under the authority of the prefect of each department who approves it with regard to the needs of individual communities.

PPR is formulated for reference to all citizens, enterprises and instruments of the government. It is a unique procedure, which takes account of risk analysis for land-use planning. Presently, more than 2,350 communities are covered by PPR. It is anticipated that by the year 2005, at least 5,000 communities will be covered.

The Plan for the Soil Occupancy (POS) also takes due consideration of natural hazards as outlined in the French urban legal code. The PPR is then annexed to the POS of the community. It complements other instruments that highlight the potential risks in various types of land use, natural resource protection, construction activities, and the administrative management of territories.

The French Ministry of Land-Use Planning and the Environment has established a national list of communities at risk, which is updated twice a year from information supplied by prefectures. The Ministry has published these risk maps on the Internet for easy access by the inhabitants of communities, but also to underline their ready availability for use by decision makers, notaries and insurers. The database is called Corinte, for *Communes à risques naturels et technologiques*. It provides information on major risks by department, types of risk, individual risk analysis, land-use planning, departmental consolidated files and listings of prevention measures undertaken.

Figure 5.1
Land-use planning in Nicaragua



Box 5.21
The French Plan of Prevention against natural risk

A compensation scheme for natural disasters has existed in France since legislation was passed on 13 July 1982. The law of 2 February 1995 put in place the Plan of Prevention against Natural Risk (PPR), in order to inform citizens about risks in their community and how to protect themselves and their properties.

The PPR is a unique procedure taking into account natural risks in land-use planning, and abrogates all procedures issued before it. A causal link exists between the PPR and the compensation scheme. In fact, a sliding scale is introduced to vary deductibles, which normally go with the compensation of property insured, in order to encourage loss prevention measures.

For example, a state of natural disaster may be declared in a community as a result of flooding (by means of an inter-ministerial decree). In this case, a coefficient is applied to the deductible, based on the number of decrees already issued, in respect of the same natural disaster, since the creation of PPR in 1995.

If the insured person has a disagreement with the insurance company, they may call on the Central Rating Bureau (BCT), a regulatory body for certain types of compulsory insurance or cover. In cases where a PPR specifies protective measures, and if the insured person has failed to conform to the provisions of the PPR, the insurance company may refuse cover if goods or activities have been located in areas that are unsuitable according to the PPR.

Case: India

In keeping with the objectives of the *Yokohama Strategy and Plan of Action for a Safer World*, a Vulnerability Atlas of India was developed in 1997. It has proved to be an innovative tool for assessing district-wide vulnerability and risk levels of existing building stock.

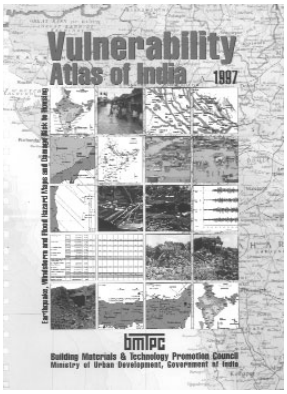
The atlas has helped state governments and local authorities to strengthen regulatory frameworks. This was achieved by amending construction by-laws, regulations, master plans and land-use planning regulations for promoting disaster resistant design and planning processes.

The documents and methodologies for vulnerability and risk assessment, along with technical guidelines for disaster resistant construction, have shown high potential for transfer, adaptation and replication. After the Gujarat earthquake in 2001 the relevance of the atlas has been highlighted and additional assessments in a more detailed scale are now being developed.

India has been successful in modifying land use by seeking to address community requirements so as to gain wider commitment in executing land-use changes. A national policy backed by local efforts is crucial to the success of these programmes.

Indian state governments are responsible for development plans, in particular those that contribute to natural hazards management, agriculture and land management. The first major initiative for preventing flood hazards in the Ganges plains was in 1960-1961 in the form of a soil conservation scheme in the catchment areas of the river valley projects as recommended by the National Flood Commission.

The National Watershed Development Project for Rainfed Areas also aimed at promoting appropriate land use and the development of farming systems on a watershed basis. A national land-use policy outline adopted by the government presents a cohesive and coordinated strategy by government agencies and others to ensure the optimal use of land. In this connection, a national land-use and conservation board and state land-use boards have been established.



The Indian experience has shown that measures to prevent disasters succeed to the extent that they focus on resource regeneration of the community living on the lands concerned. The approach needs to address both spatial and temporal dimensions of land use. Sustainability and effectiveness of interventions depend on appropriate land usage, for which peoples' participation in the planning and decision-making is a requirement.

Future challenges and priorities

Land-use planning

Land-use management and planning are practiced in many countries. There is considerable scope for the planning profession to take greater cognisance of risk factors throughout the various activities that comprise living conditions, growth prospects and environmental consequences.

As well-considered land-use planning is one of the foremost practices in this respect in both urban and regional scales, many challenging issues remain to be addressed before known methods become fully effective in reducing public exposure to risk. Competing interests or values associated with the possible uses of land almost always become an overriding issue that can be resolved only from some common understanding being reached. This most typically occurs either under law, by official instruction or through the wider acceptance of a common appreciation of relative risks.

There are additional limitations to land-use planning as a tool for risk reduction that pose future challenges. A lack of current information about hazards and potential risks within specific areas is a common limitation that must be addressed within individual localities. This is tied to the resulting undesirable consequences of a community's inability to anticipate hazard events or to undertake necessary measures to minimize their potential effects.

The often high costs and protracted nature of multidisciplinary involvement associated with the technical aspects of hazard mapping or vulnerability and risk assessment activities can be considered an impediment to establishing a systematic land-use programme. This can however, be overcome if a strategic approach is adopted which reviews plans and schedules various stages of activity over a period of time.

A more engrained and methodological approach also can counter a hesitancy to commit funds for seemingly intangible returns. A crucial challenge is to allay such uncertainties of expected benefits at a possible unspecified time in the future, in part by focusing on meaningful accomplishments that contrast with more immediate opportunities for short-term gains.

Most fundamentally though, efforts need to be exerted to minimize local political interests or community tendencies which resist a wider acceptance of the beneficial rationale for land controls. This may be associated with various related concerns such as competing economic valuations of properties or locations, weak or marginal interest in the enforcement of land-use policies, problematic licensing practices, and lax administrative procedures which invite noticeably corrupt practices in too many countries.

Ultimately a crucial priority needs to be accorded in weighing private, individual or singular uses of land against a wider concern for public values and the more broadly applicable considerations of public safety and socially determined access. The determination of how that balance is struck and where it is actually displayed in physical terms remains an obligation for public expressions of interest and concern.