

## 5.2. Land use planning

There is a fundamental need in disaster risk management to recognise the relationships between population growth, the physical demands of human settlement, short and longer term economic trade-offs and the most appropriate use of available land. While the application of informed and consistent planning practices are crucial to minimise the potential loss of physical assets or environmental capital, a greater principle lies in treating the landscape itself as a valued resource to manage risk. Failure to act on this basis is to invite disaster.

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

- The importance and difficulty of land use planning
- A delicate balance and measured benefits
- Principles regarding land use management and urban planning
- 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 minimising associated risks. It is also one of the most challenging to implement because of the often conflicting values about land held 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 to the economic attractions which flood plains or volcanic slopes hold for inhabitants. In other countries wetlands are drained to become industrial parks or housing estates.

The determination and wide acceptance of the most suited use of land, whether it is privately or publicly held, is demanding enough. It becomes even more daunting if there are variously held views about the role that land can, or should play in terms of reducing collective exposure to risk. Questions invariably revolve around whose land, whose risk and who is to benefit. Too often, the desire for short-term gains are prone to override anticipated benefits that stretch further into the future.

For these reasons, land use management and the related aspects of regional or territorial

planning, have to be considered as natural extensions of conducting hazard assessments and risk mapping. They essentially must take account of the spatial parameters of physical vulnerability considered in accordance with the broader social and economic requirements of a society. Such forms of planning used to be considered as a largely technical exercise, but planners and local political authorities are increasingly realising that members of affected communities have to be 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 in their own interest by one group of people living along a river can easily have a significant bearing on diminishing the fortunes or increasing the risks of others who live downstream or on the opposite shore.

Government authorities need to play an essential role in the judicious assessment of such relative merits, but there is equally a requirement for popular involvement in determining the basic parameters of what should constitute acceptable levels of risk. The informed participation of the public is also essential in the development of municipal or territorial standards and the acceptance of regulatory practices if otherwise seemingly intractable social, environmental and economic challenges are to be addressed successfully.



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

### ■ A delicate balance and measured benefits

The conscious recognition of the role of land use management and planning practices as viable means to reduce disaster risks are part of larger risk scenarios, best considered in local community contexts.

Regulatory approaches which emphasise 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 applicable to developing countries with the burgeoning of megacities, inadequate housing and basic services for large percentages of the population, a rising tide of migrants and unmanaged, informal economies. Unfortunately, it is in such places where the need for planning is greatest.

Some hazard specific examples with regards to land use planning are briefly presented.

#### ● Earthquakes, volcanic eruptions and avalanches

Seismic microzonation allows for identification of earthquake prone areas at a local scale. This can be used to maintain low levels of building density or directly avoid the development in such areas. Microzoning has proved to be particularly effective for the establishment of setback distances from active fault-lines, within which building is not permitted (see Box).

#### Land use in California, U.S.

In many counties and cities of California, setback ordinances are a major device that is applied to enforce seismic safety. Thus, building and stability slope setbacks can be recommended where proposed development crosses known or inferred faults, as well as where unrepaired active landslides - or old landslide deposits- have been identified. Setbacks can also be used to impose the 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, 1997*

Risk arising from volcanic eruptions can also be substantially reduced by means of limiting the development in hazardous areas. In that 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 methodologies for mass movement related hazards, such as landslides and avalanches. That is the case for Switzerland, where a three colour-coded zoning system guides the development of both public and private buildings.

The Swiss code has been applied in many parts of the world. The map on next page showing a landslide-prone area in the zone of Paccha, in southern Ecuador, illustrates the use of hazard maps with the aforementioned three colors code. This map is one of the results of a large research project on natural hazards in this region of Ecuador, PRECUPA, sponsored by the Swiss Humanitarian Aid and Disaster Relief Unit (SDR) between 1994 and 1998. Based on the findings of this project, a new ordinance for the use and occupation of the urban land has been promulgated, allowing a safer expansion of this area.

### Land use in Switzerland

Based on hazard maps, charts of degrees of danger are developed in order to guarantee a homogenous and uniform means of assessment of the different kinds of natural hazards affecting Switzerland (floods, snow, avalanches, landslides, etc.). Two major parameters are used to classify the danger: the intensity and the probability (frequency or return period). Three degrees of danger are defined and are represented by the colors red, blue and yellow. The estimated degrees of danger have implications for land use. They indicate the level of danger to people and to animals, as well as to property. A description of the magnitude of damage which 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. The degrees of danger are initially assigned according to their consequences for construction activity: areas where buildings are not allowed (red: high hazard); areas where building must follow safety requirements (blue: potential hazard); and areas without building restrictions (yellow/white).

According to Art. 6 of the Federal Law for Land-use-Planning, the 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.

*Source: Olivier Lateltin and H. Raetz, 2001*

### ● Floods

Flood management strategies are constantly being rethought. One approach draws upon observations of flood adaptation in traditional societies in which communities learned to reduce their exposure and vulnerability to floods through a variety of techniques. These include building modifications such as the stilt

houses of Malaysia, or effective social measures like the mutual aid that is often evident in strong and supportive kinship relationships within local communities.

Therefore, modern strategies need to adopt a sustainability perspective and emphasise the wiser use of flood plains and coastal flood zones. Such an outlook is grounded in antici-



Central Committee for Floods and Storm Control (CCFSC), Hanoi, Vietnam, 2000.



## Principles regarding land use management and urban planning for risk reduction

The following principles apply not only to land use management plans, but in particular in the context of risk reduction strategies.

1. **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.
2. **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*, management plans encourage participatory management for community works and urban projects.
3. **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.
4. **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, communications – and as now recognised, risk management.
  - *Individual sectoral issues* include housing, health, education, agriculture, natural resources, the economy and trade.
5. **The practice of land use management proceeds through three stages.**
  - *Strategic planning*
  - *Administration and fiscal control*
  - *Follow-up and monitoring*
6. **Successful land use management plans will confront challenges.**
  - *Tensions or vested interests*, that can occur between government and private interests, national and local interests, or instruments of the state and the population.
  - *Dynamic factors*, such as population growth, migration, conflicts over the use, demand for, or supply of services.
  - *Factors specific to risk management*, including the changing extent or nature of vulnerability, major fluctuations in land values, urban services and environmental services.
7. **Successful strategic land use management requires essential resources.**
  - *A clear legal and regulatory framework* defines the competencies of the various stakeholders and the “rules of the game”, including the role of each actor in the various stages of planning.
  - *Access to information* on regulatory plans, land and property markets, public and private investment projects is crucial for ensuring effective citizen participation in decision-making.
  - *A decentralised fiscal policy* strengthens the capacity of local governments to raise revenue and to consolidate their finances in the interest of effective local administration.

*Adapted from CERCA, UN-HABITAT, Central America, 2000*

patory approaches: empowering local communities to make choices, promoting disaster resilience, improving local and socio-economic adaptive capacities, and ensuring intra- and inter-generation equity. These strategies embrace retreat from flood zones, by means of both accommodation and protective approaches as illustrated below. Previously heralded engineering remedies or hard defences, are increasingly being replaced by environmental considerations such as mangrove swamps or wetlands which can act as soft defences.

Successful communities or nations seek to strike a balance in which flood disaster potential is weighed against other socio-economic goals and benefits. They recognise that land use change in any part of a river catchment may adversely affect flood flows and are prepared to address source controls. They make increasingly informed decisions based upon sound, high quality information and stakeholder participation, and they frequently reassess flood risks. They seek to foster flood-resistant designs in physical, economic and social structures, partly through encouraging self-help and self-reliance. They equally value traditional or new and emerging technologies that may help increase resilience.

#### *Case: Cuba*

In Cuba, national land use planning and management are truly integrated into risk reduction considerations. For over forty years, the Institute for Physical and Spatial Planning, has been the responsible body for the implementation of physical planning in the country. Their planning system integrates all scales of political and administrative jurisdictions, from municipal to provincial and national levels, in addressing a wide range of land use-related issues. These include the management of natural resources, decisions about human settlements and the environment, hazards, vulnerability and risk.

The institute defines regulations and provides methodologies pertaining to risk reduction 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 conceptual, 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 hydro-meteorological service, are other key organizations in these strategies.

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

The second type of mechanism employed consists of regulations and management practices. These include directives for the spatial allocation of investments that provide guidance for locating building projects according to land use criteria by the spatial location of building projects prior to their financial approval. The consideration of physical vulnerability included in the land use criteria of these directives, as well as environmental impact assessments, are therefore incorporated at this stage in land use planning.

As in other island states, coastal areas constitute the most fragile and complex ecosystems found in Cuba. Their increasing vulnerability to the impact of natural disasters has motivated the government to support studies on land use management. Schemes define guidelines for the use of coastal areas at the national level, identifying priority scenarios, where higher resolution studies need to be conducted. A hazard map for storm surges considered at the national scale, plus additional vulnerability maps, have been produced. The combined 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 has been conducted in Havana Province, following analysis conducted in 1998 which revealed deficiencies in land use management. By working with the government, UNESCO contributed to develop this study. The reduction of vulnerability to disasters has been included as one of the main goals of this initiative. The implementation of measures will be undertaken 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 issued:

Direct measures:

- 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 the adequacy of potable water supplies and sanitation systems.
- Improve health and transportation services.
- Create employment opportunities.

Indirect measures:

- 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 km 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 located in the vicinity which is at high risk. A plan approved by the Administration Council of Havana in 1995, is now applied to all urban planning projects in these seaside areas. Thanks to the vulnerability zoning implemented through this plan, codes and standards for construction have been renewed with the aim to improve the organizational pro-

cedures, 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.

In conclusion, land use management and urban planning in Cuba constitute 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 upon new methodologies has been applied, contributing to more effective implementation of disaster reduction activities. Moreover, the multidisciplinary and inter-institutional nature of the work undertaken in land use planning and management has helped to establish a conceptual and more methodological 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.

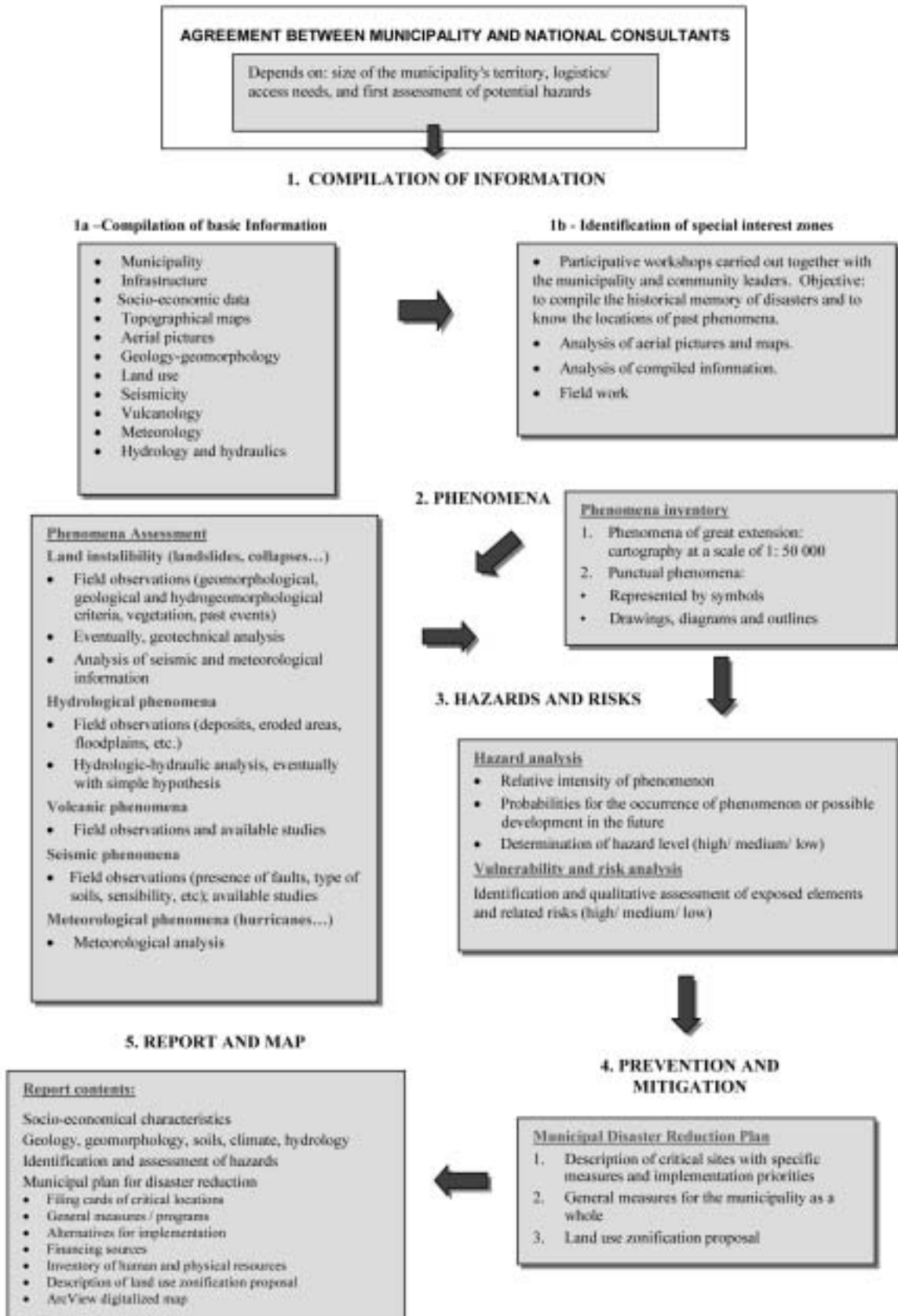
*Case: Nicaragua*

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



Workshops with the participation of local actors in their own communities.

General methodology used for municipality studies





sionals, who received special training developed these tools by working in a participatory manner. Illustrations below show the process being used and examples of the results obtained in the project developed in the country with the support of the Swiss Agency for Development and Corporation (SDC).

The diagram on the previous page below illustrates the methodology used to produce a municipal study by the national professionals. The basis is a thorough, scientific, multiple-hazard and multiple-risk analysis of the whole study area, taking account of local knowledge and specialised information (steps 1 to 3). The core of the study is the elaboration of the municipal disaster reduction plan, which involves the production of the different risk management tools illustrated in the next figures.

#### *Case: France*

The *Plan for the Prevention against natural Risks (PPR)* is the main tool in the overall French strategy of natural disaster risk reduction. It aims at controlling the use of natural and rural spaces and expresses the responsibility to inform citizens about the risks they may be exposed to, as required under Article 21, of 1987. Citizens are able to familiarise 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. The 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 means undertaken following the evaluation of the degree of predictable hazards. Resulting risk maps form the basis of consideration which leads to the implementation of PPR and related legislation. The 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. The PPR is formulated for application 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, 2,350 communities are covered by a PPR. It is anticipated that by 2005, 5,000 communities will be covered.

An additional *Plan for the Soil Occupancy (POS)* also takes due consideration of natural hazards as outlined in the French Urban Code. The PPR is then annexed to the POS of the community. It complements other instruments which 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 of the Environment (MATE)* has established a national list of communities at risk, which is updated twice a year from information supplied by prefectures. MATE 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 insurance interests. Known as *Corinte* for *Communes à risques naturels et technologiques*, it is a database providing information on major risks by department, types of risk, individual risk analysis, land use planning (PPR), departmental consolidated files (DCS) and listings of prevention measures undertaken. This public service of the prefectures is available at [www.environnement.gouv.fr](http://www.environnement.gouv.fr) and [www.prim.net](http://www.prim.net) and it is regularly updated by MATE.

#### *Case: India*

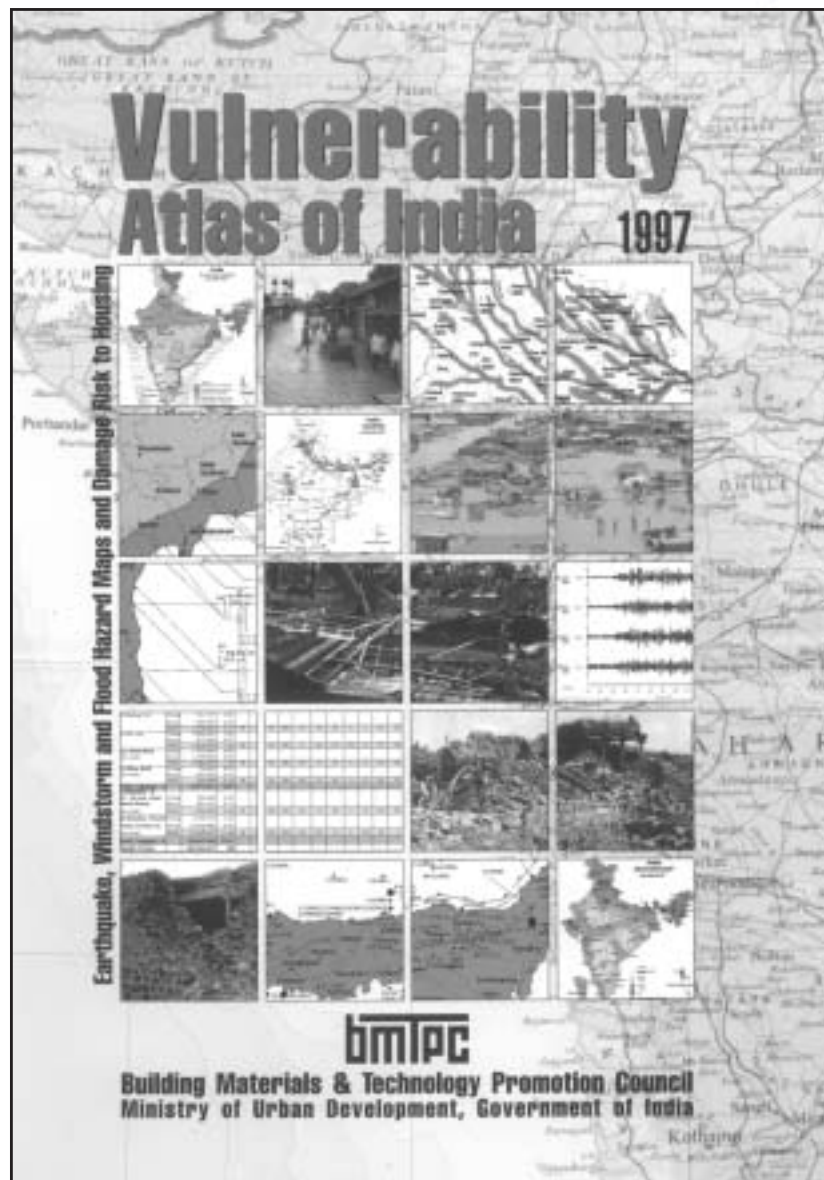
In keeping with the objectives with the Yokohama Strategy, a Vulnerability Atlas of India was developed and ready in 1997. It has proved to be an innovative tool for assessing district-wide vulnerability and risk levels of existing building stock. The atlas has helped state governments and local authorities to strengthen regulatory frameworks by amending the building by-laws, regulations, masterplans 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 constructions, have shown high potential for transfer, adaptation and replication. After the Gujarat earthquake in 2001 the relevance of the Atlas have



been highlighted and additional assessments in a more detailed scale is now being developed. Indian programmes have met with success in modifying land use by seeking to address community requirements so as to gain their commitment in ushering land use changes. A national policy backed by local effort 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 Gangetic plains was in 1960-61 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 watershed basis. A National Land Use Policy Outline adopted by the government of India presents a cohesive and coordinated strategy of schemes by various 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.

Indian experience has shown that measures to prevent disasters like drought and floods suc-



ceed to the extent that they focus on resource regeneration of the community living on the lands concerned. The approach has to be holistic and needs to address both spatial and temporal dimensions of land use. Sustainability and effectiveness of interventions depend on engendering appropriate land usage, for which peoples' participation in the planning and decision-making is an obvious requirement.



### Future challenges and priorities

Land use management and planning are practised in many countries. However, as was mentioned at the beginning of this section, well-considered land use planning carried through to the successful accomplishment of reducing risks remains extremely challenging for a number of reasons. Competing interests or values associated with the various possible uses of land almost always become an overriding issue that can only be resolved from some common understanding being reached, either under law, official instruction, or through a common appreciation of relative risks.

There are an additional number of practical limitations to address to enhance land use planning as a tool for risk reduction, which include the following:

- The lack of current information about potential hazards affecting a specific location, and the nature and relative magnitudes of their possible impacts within a specific area.

- The high costs and protracted nature of multidisciplinary involvement associated with the technical aspects of hazard mapping or vulnerability and risk assessment activities.
- An inability to predict hazard events or for the community concerned to fully appreciate the possibility of risk.
- Hesitancy to commit funds for seemingly intangible benefits at a possible unspecified time in the future, overshadowed by clear and immediate opportunities for short-term gains.
- Local political or community resistance to accept the rationale for land controls, often compounded by weak or marginal interest in their enforcement. Licensing procedures are noticeably corrupt in many countries.

There are many links to the challenges described in chapter two related to risk assessments.