

A faint, light blue world map is visible in the background of the top half of the page. The map shows the outlines of continents and oceans.

# Chapter 5

## A selection of disaster reduction applications

This chapter discusses different applications of disaster risk reduction, as outlined in the graphic representation presented in chapter 1. These efforts become possible after previous activities to identify and assess risks and institutional capabilities are in place.

The selection of disaster reduction applications discussed in this chapter is not exhaustive, it serves to illustrate the scope of activities and applications in the field and in certain cases, assess their strengths and weaknesses. The chapter begins with environmental management - an area often neglected by traditional disaster managers - and concludes with early warning systems - a crucial link to effective preparedness and response activities.

- 5.1 Environmental management
- 5.2 Land use planning
- 5.3 Protection of critical facilities
- 5.4 Networking and partnerships
- 5.5 Financial and economic tools
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## 5.1 Environmental management

A healthy environment enhances the capacity of societies to reduce the impact of natural and human induced disasters, a fact largely underestimated. As disasters undermine both socio-economic development and environmental management efforts, there is a compelling need to explore how environmental mismanagement changes hazard and vulnerability patterns.

The use of environmental management and knowledge tools as a strategy for reducing vulnerability to risk should be promoted. Environmental actions that reduce vulnerability need to be identified and applied by disaster reduction practitioners. Quantitative measurement of these actions will determine their acceptance and application in political and economics arenas. Platforms for integrating environmental management within existing policy frameworks and international strategies on disaster reduction, sustainable development and poverty reduction will build a safer world. National and regional governing institutions can best increase societies' resilience to disasters as part of a global environmental management effort. Instilling disaster thinking into environmental performance is a win-win proposition.

This chapter begins with a description of some of the **links between disaster reduction and environmental management**. The following **environmental management tools** are then described and questions about their **relevance and application** in disaster risk reduction strategies considered.

- Environmental legislation
- Environmental policies and planning
- Institutional arrangements
- Environmental impact assessments
- Reporting on the state of the environment
- Ecological/environmental economics
- Environmental codes and standards.

Applications of these tools will be illustrated through examples pertaining to wetlands, forests, fisheries and agricultural systems, barrier reefs and islands, mangroves, coastal areas, watersheds and river basins, freshwater, mountains, as well as to environmental issues such as biodiversity, climate change, desertification/land degradation.

### Environmental management as a tool to reduce disaster risk

Environment and disasters are inherently linked. Environmental degradation exacerbates the impact of natural disasters. It affects natural processes, alters humanity's resource base and increases vulnerability. The degree to which environment can absorb impacts, increase overall resilience and provide effective and economical solutions to reduce disaster risks is therefore jeopardized. Furthermore, societies' traditional coping strategies are challenged.

Practices that protect the integrity and diversity of nature and ensure a wise use of natural

resources provide solutions to reduce vulnerability from which both the environmental and disaster communities will benefit. Although the inherent links between disaster reduction and environmental management are recognised, little research and policy work has been undertaken on the subject. The intriguing concept of using environmental tools for disaster reduction has not yet been widely applied by many practitioners. Hurricane Mitch highlighted in dramatic fashion the indispensable role of sound environmental management in sustainable development and natural disaster mitigation. Therefore, environmental management tools that have the potential to make a substantial and cost-effective contribution to reducing the vulnerability to natural hazards



should be identified, adapted and adopted. In this regard, a crucial element to enhance the conservation of nature to reduce vulnerability to disasters will be a true valuation of the ecological balance.

Environmental actions that reduce the vulnerability to disasters are seldom promoted in disaster reduction strategies and usually appear only as a beneficial but unplanned side effect. But these activities will add to the options for disaster reduction. Widely disseminating examples of their application to relevant actors will encourage their use. Links between the disaster and environment communities will benefit from efforts made to use similar language and approaches. Once tools and policies are developed, capacities will need to be built locally in vulnerable regions to assess and respond to environmental sources of vulnerability and use environmental tools to reduce disaster impacts. The *World Conservation Union (IUCN)* and the *International Institute for Sustainable Development (IISD)* have launched an initiative to promote the use of environmental management to reduce the vulnerability of communities to the growing threat of climate change and climate-related disasters. The *Stockholm Environmental Institute (SEI)* was also involved. It serves as an important step to translate the intuitive recognition of the protective function of natural systems into useful products for practitioners.

*Ecosystems are interdependent networks of organisms of a naturally defined eco-zone that function as a unit. Examples include natural forests, wetlands, deserts, lakes and mountain regions. The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an viable way. Thus, the application of the ecosystem approach will help to reach a balance of the three main objectives of sustainable development: conservation, sustainable use and the fair and equitable sharing of the benefits arising out of the utilization of resources.*

At present, environmental management tools do not systematically integrate trends in hazards occurrence and vulnerability. Similarly, disaster reduction practitioners do not systematically explore the advantages of using environmental management tools and approaches. Some benefit might be drawn from the fact that environmental tools were essentially developed

### Lessons learnt from Hurricane Mitch

“So far, relatively little is being channelled to attack the root causes of vulnerability, or to contribute to the non-structural mitigation of disasters through sound environmental management, integrating regional and integrated territorial planning at a scale that goes beyond individual plots or local communities...

For these issues to be addressed, there is a need to integrate risk management into environmental policy. How do healthy ecosystem contribute to abating risk? What has been the environmental impact of land concentration, misuse of wetlands and massive deforestation? ... Finally, the long term environmental security of Central American societies will depend to a significant degree to the capacity for adaptive and cross-scale *In Situ* management of key buffering ecosystem functions. More applied research is needed on the linkages between local forest management practices and their effect on hazard mitigation.

There are encouraging initiatives which seek to contribute to more secure human livelihoods through empowering local communities to manage risk locally. There is a growing interest in the restoration of key forest ecosystems, geared to providing local communities with more adapted livelihoods and a secure environment. Mitigation is best applied locally, but require adequate linkages into the policy sphere to guarantee the long term governance of the region.

The new quadrennial programme proposed by the IUCN, provides a key framework in which to apply these ideas to the Central American context. The post disaster context is ripe for proposing innovative approaches to disaster prevention and mitigation.”

Source: *P.Girot, IUCN/CEESP Mesoamerica, 2001*



The World Conservation Union (*IUCN*) and the *International Institute for Sustainable Development* (*IISD*) have joined forces to promote the use of environmental management and policy tools to reduce vulnerability of communities, especially the poor and marginalized, to the growing threat of climate change and climate-related disasters. The project seeks to:

- identify environmental actions that reduce the vulnerability of social and economic systems;
- enhance the role of these activities by offering a tool kit of options with detailed examples of their application to relevant actors in research, advocacy, policy-making and industry;
- build the capacity of local institutions in regions and countries vulnerable to climate-related disasters to assess and respond to the environmental sources of vulnerability;
- create a platform for integrating environmental management measures that reduce community vulnerability into existing policy frameworks and international strategies on disasters mitigation, climate change adaptation, biodiversity conservation and poverty alleviation.

The initiative is guided by a task force on climate change, vulnerable communities and adaptation composed of a multidisciplinary group of experts from the fields of climate change, disaster reduction, sustainable livelihoods and environmental management and policy. Working from different points of departure, members will explore how natural resource mismanagement contributes to the vulnerability of human systems, and how enhanced management can provide tools for vulnerability reduction.

It will produce the following:

- case studies that improve the understanding of environmental factors which shape vulnerability to climate-related disasters, and the options for adaptation within policy frameworks;
- guidelines for reducing vulnerability to climate change and climate-related disasters using environmental management tools;
- a network of institutions at the regional and national level with the capacity to assess and address vulnerability to climate-related disasters.

from a risk management approach, environmental/social impact assessment processes being traditionally geared towards identifying risks as early as possible and then addressing them in the design phase of plans or projects.

Furthermore, synergies might exist between research work on disaster reduction and on the integration of environmental concerns into decision-making and development planning. The IDNDR conclusion that “environmental protection, as a component of sustainable development and consistent with poverty alleviation, is imperative in the prevention and mitigation of natural disasters” needs to be put into practice.

Environmental management can become a cost-effective tool for disaster reduction while serving many other objectives including conservation of biodiversity, mitigation of adverse global environmental changes and poverty alleviation.

The protective role of some ecosystems are more recognised than others and are begin-

ning to be better documented. For example, important wetland functions include water storage, storm protection, flood mitigation, shoreline stabilization and erosion control. These functions are also essential for sustainable development. The value of these functions are considerable as technical alternatives are often more expensive. However, benefits from wetlands are under threat from natural disasters including storms, drought and floods which will be further exacerbated by climate change.

Wetlands also suffer from increased demand on agricultural land associated with population growth, infrastructure development and river flow regulations, invasion of alien species and pollution. The relationships between climate change and wetlands deserves more attention by policy makers.

Adaptive capacities of ecosystems to absorb sudden shifts in climatic, geological or biological components is a key feature increasing disaster resilience. In this regard, traditional

## Global environmental issues and disaster reduction

### *Climate change*

Consequences: extreme weather events, changes in boundaries, structure and functioning of ecological systems (forests), food security, water availability, sea level rise

Solutions: reforestation, adaptation programmes, including early warning, disaster preparedness

### *Loss of biological diversity*

Consequences: loss of natural resources and diversity interfering with essential biological functions such as regulation of water runoff, control of soil erosion, loss of resilience to disturbances and environmental change

Solutions: conservation/restoration (forestry, agriculture, coastal zone management)

### *Freshwater degradation*

Consequences: water quality and scarcity, droughts, health risks, economic impact of land degradation on water resources, increase in floods due to poor land use that pollutes water

Solutions: water resources management, land use management

### *Desertification and land degradation*

Consequences: improper resource use, food security, loss of ecosystem productivity

Solutions: alternative livelihood programmes, sustainable land and natural resources use programmes, natural environment and development planning

## Environmental systems contribute to disaster reduction and security

Maintaining and rehabilitating resilient environmental and social systems form key building blocks for disaster reduction and security. The fire and smoke episode of 1997-98 in Southeast Asia, Russia, the Americas and the Mediterranean helped focus attention on an increasing problem. The application of fire in land-use systems and forest conversion was associated with the extreme drought caused by the El Niño southern oscillation event which created conditions for the escape and spread of uncontrollable wildfires. While some fires were deliberately set to cover up illegal logging, most of them were intended to convert forest to other land uses. Small farmers, plantation and timber companies, government settlement schemes and subsidy policies were responsible for damages. Better knowledge and monitoring is necessary to distinguish well-balanced natural fires beneficial in maintaining land-use systems from those fires which destruct societies and environment. Basic structural improvements, accompanied with improved legislative, economic and technical basis are needed to make physical infrastructure, natural and human systems and water management more resilient.

societies have great adaptation capacities to cycles of environmental change. It is known that living with floods strategies are cost-effective, relatively easy to implement and more compatible with the environment, and can more easily be incorporated in long-term development planning at little extra cost.

Forests play an important role in protecting against landslides, erosion, floods and avalanches. They also safeguard against drought. As shown in Switzerland, continuous care brought to forests including rejuvenation, careful diversification of species and structural stability ensure an optimal protective role and save money from disruptions caused by natural hazards.

The Yangtze river floods in 1998 showed the consequences of the loss of healthy ecosystems. As a consequence, the Chinese government banned logging in the upper watershed and

increased reforestation efforts, and prohibited additional land reclamation projects. China carries out flood prevention and water resources protection as a means to lessen the impact of landslides and floods. Barrier reefs, barrier islands and mangroves contribute significantly to the mitigation of hurricane risk, storms and tidal surges.

Sound watershed management that combines parks protection, reforestation, sustainable forestry and agricultural practices is critical to protect downstream communities, livelihoods, agricultural lands and economic infrastructure such as roads, ports, hydroelectric dams, and irrigation systems. The crucial environmental services provided by integrated watershed management must be recognised when making policy and investment decisions. This becomes even more important in light of the international or inter-provincial nature of river basins.

## Environmental legislation

Agenda 21 (*see chapter 6.1*) notes that “laws and regulations suited to country-specific conditions are among the most important instruments for transforming environment and development into action.” Legislative responses to environmental problems testify of countries’ appreciation of the adverse impacts of environmental degradation on socio-economic systems. Many developing countries have by now adopted legislation dealing with a broad range of issues including protection of water resources or biodiversity conservation.

Framework environmental legislation mostly deals with cross-sectoral issues including establishment of environmental standards and norms, the use of economic instruments for environmental management, environmental impact assessment procedures, institutional settings and coordination at the national and local levels, dispute settlement, information, education and public participation.

Framework environmental statutes and basic environmental laws helped overcome the organizationally fragmented and uncoordinated approach to environmental management. More than 65 developing countries have adopted such legislation since the 1970’s. A continuing process of legal and institutional innovation shows a commitment towards sustainable development. It also provides a vehicle for disaster reduction strategies. It also provides a vehicle for disaster reduction strategies.

National environmental laws provide some basis and direction for the implementation of environmentally sound disaster reduction planning. Ways to ensure that environmental laws and disaster reduction strategies are mutually supportive, consistent and in compliance with each other should be explored.

Disaster reduction specialists should be encouraged to anticipate environmental requirements under applicable laws and design projects to address these requirements, avoid problem areas, gather necessary information and coordinate closely with environmental institutions. Also, the objective of environmental laws could explicitly address the requirements of disaster reduction by reinforcing the protection of those

natural ecosystems that have a protective function. In this spirit, **Bolivia** is harmonizing its Environmental Act with its Risk Reduction and Disaster Response Act.

The existing body of multilateral environmental agreements also provides a good basis to enhance options for disaster reduction. Among these are the Ramsar Convention on Wetland Preservation, the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Convention to Combat Desertification (UNCCD), and the United Nations Convention on Biological Diversity (CBD). These legal instruments are negotiated at the international level

### Most common environmental laws and institutional arrangements

- Constitutions (environmental component)
- Institutions (national and sectoral)
- Environment Action Plans: national (NEAP), local (Local Agenda 21), sectoral (biodiversity, desertification, climate, etc.), specific national goals and targets (where available)
- Legislation - including environmental acts/laws on environmental impact assessment (EIA)
- Command and control measures (standards, bans/limits, permits)
- Mechanism for monitoring and enforcing legislation
- Non-binding guidelines, voluntary codes of conduct (ISO 9000 and 14000)
- Greening operations at governmental level
- Environment litigation and judicial interventions (court cases)
- Mechanisms for tracking impact and progress (environment performance)
- Bilateral and multilateral agreements (e.g. Mekong River Commission, SADC Protocol shared waters, CBD, UNFCCC, UNCCD)
- Ratification/implementation of international agreements
- Regional environment/sustainable development bodies and organisations (e.g. South Pacific Regional Environmental Programme (SPREP), Caribbean Conservation Authority (CCA))
- Financial mechanisms
- Transboundary environment laws (e.g. concerning international waterways, UN Law of the Sea)
- Trade policies (e.g. trade agreements, WTO policies and regulations on the sustainability of resource use)

The themes of concern to many multilateral United Nations environmental conventions are of great importance in **Central America**. These issues are the increasing occurrence of drought and desertification, protecting biodiversity, preservation or re-establishment of wetlands and the anticipation of the socio-economic consequences of global climate change. Basically, as all of these concerns have crucial relationships with risk and disaster reduction concepts, the synergy between them is of growing importance in the region. Potential changes in rainfall patterns, increased hurricane incidence and strength, the loss of ecological resilience and natural ecosystem protection, rising sea levels, coastal degradation and the loss of mangrove swamps, presage new risk conditions in the future, and the need for new adaptive, mitigation and prevention schemes, implemented on an incremental basis.

IUCN has worked throughout Central America to broaden its role in risk reduction and to coordinate with risk specialists in promoting project activities. The promotion of synergies between multilateral environmental conventions has led to more appreciation of the close relationships that exist between efforts to promote community adaptation and resilience to the natural environment and to reduce the risks of disasters. A forum organized by the Ministry of the Environment in El Salvador in October 2001 was built around these concepts and it sought to achieve more common understanding and to explore opportunities by which adaptation practices could be applied in different zones of the country.

but are implemented through national policies, strategies, action plans and laws. More details on some of these instruments can be found in chapter six.

Existing legal instruments and ongoing work on sustainable mountain development are also pertinent to disaster reduction. For example, the *Alpine Convention of 1989* places some emphasis on natural hazards and addresses land use planning, soil and landscape conservation, water management, forests and farming. Specific obligations to reduce the impacts of natural and manmade disasters, including land use planning, watershed management,

#### *Klang River (Malaysia) Flood Mitigation and Environmental Management Project*

*Funded by the Asian Development Bank and undertaken under CBD, the project objectives are to improve environmental conditions, including those that worsen flooding, through an integrated river basin approach that addresses environmental and economic development needs, and reduce the adverse socio-economic and environmental impacts of flooding in the Klang river basin. Some of the considerations affecting environmental management and flood mitigation are integrated river basin management, solid waste management, sediment trapping, tributary corridor improvement and flood forecasting and warning systems.*

and early warning, are foreseen in future regional mountain ecosystem agreements. These issues will be dealt with throughout

2002, as mountains are the theme of the 2002 ISDR campaign.

Disaster reduction goals can also be integrated into non-binding instruments such as regional strategies for biodiversity or the implementation of Agenda 21. In this regard, the *New Partnership for Africa's Development (NEPAD)*, an initiative to promote the socio-economic

#### **Legislation dealing with wetland protection**

The purpose of wetland protection legislation is usually to minimize the degradation of wetlands and to preserve the beneficial values of wetlands. This means that for development activities, alternatives to wetland sites or limiting wetland damage must be considered. Such provisions usually apply to acquisition, management, and disposition of land and facilities, construction and improvement projects, activities and programs affecting land use, including water and related land resources planning, regulation, and licensing activities. Valuable information produced includes detailed wetland maps, studies and reports on wetland characteristics, documentation of compliance and consistency with floodplain management programs.

**The China** National Wetlands Conservation Action Plan finalized in 2000 is an example of a specific environmental legislation supporting disaster reduction.



development of Africa, deserves attention. Its draft programme of action includes six priority areas: land degradation, desertification and drought, wetlands, climate change and cross-border conservation and management of natural resources.

### Environmental policies and planning

As in the case of environmental legislation, environmental and disaster reduction policies need to be mutually supportive as part of the sustainable development agenda. The critical gap between macro economic policy-making and environmental hazard considerations needs to be addressed. Sustainability and long-term benefits will result from integrating hazard thinking into decision-making relating to environmental practices.

Designing a **national environmental action plan (NEAP)** is a formal standardised process that is widely used. Characteristics of disaster reduction and environmental policies are similar. Both are meant to meet local need and sustainable development requirements, produce multiple benefits, rest on extensive participation of the public and all relevant sectoral and disciplinary stakeholders. Socio-economic goals, including poverty reduction, expansion of food security, improvement of human settlements conditions, maintenance of resource base for future generations will be met if environmental problems and risk are reduced.

Some of the features of integrated environmental/disaster reduction policies include:

- Assessment of environmental forces of hazards occurrence and vulnerability
- Assessment of environmental actions that reduce vulnerability
- Assessment of environmental consequences of disaster reduction actions
- Consideration of environmental services in decision making processes
- Broad-based and interdisciplinary approach that will ensure the integrated use of natural and social sciences in disaster reduction planning and decision making
- Partnerships and regional approaches to land use and nature conservation
- Reasonable alternatives to conflicts concerning alternative uses of resources

- Advice and information to involved actors in enhancing the quality of the environment

Water policies (water pricing and hydropower regulation) offer an example of environmental policies with a beneficial impact on disaster reduction. They can be designed to promote sustainable use of water and allow adjustments depending on seasonal forecasts to avoid floods. Water policies guarantee that work on wetlands, floodplains and open spaces to store and cleanup runoff is undertaken. Furthermore, flood and drought risk management are increasingly looked at in the context of water resources and therefore depend on effective international water management.

#### World Bank integrating environmental management and hazard reduction

The Dominican Republic - National Environmental Policy Reform. While not explicitly addressing natural hazard vulnerability, the project perfectly matches hazard mitigation concerns as its objectives include curbing deforestation and degradation of watersheds and coastal zones. Its development objective is to establish the basis for improved environmental management by defining environmental policy reforms and elaborating a national environmental management programme.

**St. Lucia** - Integrated Watershed Management Project. The project was initiated in 1994 in response to damages resulting from floods and landslides related to tropical storm Debbie. Apart from structural rehabilitation, it also supported the formulation of a Watershed Management Plan, which would serve as the basis for more integrated and sustainable development of key watersheds and strengthen the Government's capacity in environmental management and flood preparedness.

Similarly, policies promoting sustainable management of fuel wood and development of alternative sources of energy will reduce deforestation and contribute to flood, avalanche and landslide control. Programmes undertaken as a result of commitments under the biodiversity, climate change and desertification conventions will also reduce vulnerability through enhanced natural resource management. The relationships between market prices, trade policies and environment are complex and sensitive. Trade policies based on sound environ-

mental consideration also contribute to reducing disaster impacts.

While most regions try to strengthen regulations, there is also a shift towards deregulation, increased use of economic instruments and subsidy reform, reliance on voluntary action by the private sector and more NGO participation. National environmental policies that encourage voluntary agreements as a tool to conserve natural engineering solutions will

### Bangladesh Coastal Greenbelt Project: a project serving environment and disaster reduction

Undertaken by the Department of Forest, under the Ministry of Environment and Forest, the project's main objectives are to:

- Prevent loss of life and damage to property by cyclone, storms and associated tidal surges
- Protect and improve the coastal environment through increased vegetation
- Help alleviate poverty by generating income through increased tree cover and derived products
- Increase forest resources
- Increase coastal embankment stability
- Establish industries based on forest plantation
- Increase multiple use for land
- Create popular awareness on sustainable forest management.

*From Bangladesh State of the Environment Report, 2001*

increase disaster resilience. Even though not binding and in many cases restricting long-term planning, they have some interesting potential. Donations compensated by tax benefits, leases, covenants controlling land use, charitable deductions are examples of such tools.

Several countries and regions in the world include natural disaster reduction in national environmental action plans.

One of the ten programmes of the National Environmental Action Plan of **Haiti** deals with natural disaster management; it is based on a decentralized and participatory planning approach including NGOs, the private sector and bilateral and multilateral donors.

Jamaica gives very high priority to climate change/sea level rise and natural and environmental disasters in the implementation of the *Small Islands Developing States (SIDS) Programme of action*.

The *Caribbean Planning for Adaptation to Global Climate Change (CPACC)*, funded by the *Global Environment Facility (GEF)* and executed by the *Organisation of American States (OAS)*, is one of the most important initiatives in coping with global climate change in the Caribbean. It supports the development of a policy framework for integrated planning and management for cost-effective response and adaptation to the impacts of global climate change. It incorporates specific tools such as disaster contingency planning.

In 1999, the *UN Food and Agriculture Organization (FAO)* developed a Draft Plan of Action aimed at helping SIDS countries meet the challenges of economic change, environmental degradation and natural disasters. The programs focus on agricultural trade, intensification and diversification of agriculture, fisheries, sustainable management of land, water and forestry resources, and environmental protection and strengthening national institutions. The Plan would improve disaster preparedness by promoting measures to reduce the impact of hurricanes and cyclones on agriculture and coastal fisheries. The Plan would assist the countries to assess their national meteorological and hydrological services and support early warning systems at national and regional levels.

The *South Pacific Regional Environment Programme (SPREP)* has, for many years, incorporated many disaster-related activities into its program as part of its mandate to manage the shared environment of the Pacific region. While these activities are spread throughout SPREP's programs, most have been part of the *Regional Climate Change Work Program* which emphasises the impact of extreme weather in the Pacific region and the relationships between climate change and natural disasters. SPREP is also implementing PIC-CAP which will focus on vulnerability assessment and adaptation options.

Another pertinent SPREP activity is a project on *Integrated Coastal Zone Management in the*

### Case study: Watershed management for natural disaster vulnerability reduction

Watersheds are necessary for agricultural, environmental, and socio-economic development. Watershed physical and biological resources provide goods and services to human populations, including water protection, attenuation of natural disasters by regulating runoff, protection of coastal resources and fisheries, protection of the environment, and protection of productive lowlands. The economic benefit of upper watershed protection is not easily estimated nor is it required to appreciate the key contribution of well-managed upper watersheds to downstream beneficiaries. Watershed management programs need to build on existing environmental initiatives. The following elements are required for successful watershed management:

- No permanent structures in floodplains
- All watercourses having buffer strips
- Intensive agricultural activity not permitted on slopes greater than a set percentage reflecting land capacity
- Clear cutting of forests limited, with forest conservation and sustainable forest management stressed
- Institutional body formally established to link and address conflicts
- Public participation of both men and women in management decisions
- Effective management plans and enforcement of environmental and zoning regulation
- Regional environmental impact assessments to ensure that cumulative impacts of economic activities are sustainable

Impediments to comprehensive watershed management include:

- Inadequate economic valuation of environmental services
- Inadequate institutional structure and appropriate land use practices
- Inattention to socio-economic issues contributing to poverty, a degraded environment and natural disaster vulnerability
- Actions to implement watershed management activities:
- Strengthen municipal authorities and their capacity to address land use and watershed management issues
- Establish a macro national management strategy
- Support sound land use planning, ensuring public participation in watershed planning and ecosystems protection, including gender concerns
- Support policies and market-based incentives that favour reforestation and sustainable forestry on steep upper watersheds, promote participation of private sector through the climate change Clean Development Mechanism
- Require downstream beneficiaries to pay for watershed services
- Support critical watershed protection and restoration of key ecological systems to mitigate disaster impacts
- Support local NGOs to clarify land tenure issues and facilitate access by rural farmers to formal land markets
- Establish international watershed management frameworks
- Pursue a research agenda incorporating economic valuation of environmental services, innovative financing, analysis of the relationship between land use/environmental management and the magnitude of losses from natural disasters.

From *Watershed management for hurricane reconstruction and natural disaster vulnerability reduction*, USAID, 1999



*Pacific Islands.* Coastal hazard management is a major component of the project as it includes hazard mapping and the development of disaster reduction strategies for coastal areas. In order to realise the full potential of the resources in the region, SPREP collaborates with other organisations to expand its role in assisting Pacific small island developing states to integrate disaster management, sustainable development and sound environmental practices into national planning strategies.

### **Institutional arrangements**

Environmental legislation and policies require co-ordinated organizational structures to support their implementation. The creation of new ministries responsible for the environment and of high level inter-ministerial and interdisciplinary policy advisory councils is still recent started after the Stockholm conference in 1972. Environmental ministries exist nowadays in some 23 African countries and 11 Asian countries.

Environmental functions can sometimes be performed by parastatal agencies integrated in other ministries such as housing, planning, construction, land use, agriculture and forestry. Co-ordinated organizational arrangements rationalise environmental protection and minimise fragmented sectoral approaches diffused throughout numerous government departments and local authorities that do not correspond to interactions inherent to ecosystems. Disaster reduction concerns have a place in specific environmental legislative and institutional means that promote coherent implementation of sustainable development policies. For example, almost all Caribbean countries have strengthened their environmental administrative capacities to integrate environmental considerations into physical planning.

Environmental management requires co-operative solutions, cutting across many disciplines and sectors, involving community groups, NGOs, the private sector, governmental institutions, the scientific community, and international organizations. So does disaster manage-

#### **Involvement of the El Salvador Ministry of the Environment in risk and disaster matters**

The impact of Hurricane Mitch in 1998, and the earthquakes in El Salvador in 2001, led to an increased awareness at the Ministry of the Environment in El Salvador about the relationship between development, the environment and disasters. Recent favourable experience collaborating with local community associations and NGOs in the Lower Lempa Valley Risk Reduction Project provided organizational precedents for more direct involvement by the ministry in risk and disaster matters. Following the 2001 earthquakes, the Minister of the Environment convened a committee of national and international experts to consider the creation of a new technical agency to deal with risk management issues. An executive paper created the National Service for Territorial Studies (SNET), in the Ministry of the Environment and Natural Resources in October 2001. SNET is an autonomous government agency with annual budget of about US\$ 2 million.

SNET has four divisions, three of which relate to monitoring the country's geology, hydrology and meteorology. This is the first time that these disciplines have been housed in the same institution in El Salvador. The fourth division deals with integrated risk management issues and develops vulnerability and risk scenarios.

Consideration also is being given to the formulation of a national risk reduction plan that would prioritize, guide and orient future risk management activities in the country and establish a basis for coordinating the many professional interests and different actors in the field.

SNET breaks with the tradition of adding risk reduction issues onto already established emergency disaster response or civil defence plans. By expanding on the prior experience of *The National Institute for Territorial Studies in Nicaragua* SNET may be a first step towards establishing a comprehensive risk management system in the country. It may well serve as a model for other countries, as **Guatemala** has recently requested a feasibility study to be conducted for a similar approach. Another project financed by the IADB in the **Dominican Republic** is currently evaluating a far greater role for the Ministry of the Environment, which already has legal authority to act in the area of land use and disaster reduction.



ment. Therefore organizational frameworks in place for environmental issues can be expanded to serve the needs of disaster risk reduction as part of sustainable development planning.

Many public agencies are experiencing cut-backs. Therefore, asking environmental agencies to integrate environmental considerations in other policy domains would save resources. This will require linking work in science, policy, environment and vulnerability reduction. Implementation of sustainable hazard reduction measures will need an appropriate macro planning organizational framework organizational framework establishing the critical link between policy objectives and field performance.

*Multi-stakeholder processes (MSP)* are one of the recent innovations to promote dialogue to achieve sustainable development. This dialogue model was initiated in 1998 by the *UN Commission on Sustainable Development (CSD)* and has since been adopted by other international forums. MSPs aim at bringing together all major stakeholders (non-state and government actors) in a new form of communication, decision finding (and possibly decision-making) on a particular issue.

MSP are based on equity and accountability in communication and representation between stakeholders. They are also based on principles of transparency and participation, and aim to develop partnerships and strengthen networks between stakeholders. MSP cover a wide spectrum of structures and levels of engagement. They are suitable for those situations where dialogue is possible, where listening, reconciling interests, and integrating views into joint solution strategies seems appropriate and within reach. Each situation, issue or problem prompts the need for participants to design a process specifically suited to their abilities, circumstances, and needs. MSPs have emerged because there is a perceived need for a more inclusive, effective manner for addressing urgent sustainability issues.

During the preparations of the World Summit for Sustainable Development (WSSD), stakeholders have come together to work out how to do their part to implement the sustainable development agenda. Major inputs to the discussion on disaster reduction and sustainable

development that fed into one of the ISDR background papers was drafted through multi-stakeholder electronic forums. The added value of a multi-stakeholder approach, namely increased quality, credibility and outreach, ensures an increased sense of ownership and commitment for collaborative actions plans. Search conferences are also participative processes that raise commitment for action and are applicable to collectively design disaster reduction plans.

### Environmental impact assessments

Legislative and regulatory frameworks for *Environmental Impact Assessments (EIA)* already exist and require strong institutional support, the commitment of governments, aid agencies and civil society, as well as a monitoring processes.

Risk reduction considerations could be further

*The Environmental Impact Assessment (EIA)* is a policy making tool that serves to provide evidence and analysis of environmental impacts of activities from conception to decision-making. An EIA must include a detailed risk assessment and provide alternatives solutions. It must be thorough and well documented and must provide the public an opportunity to participate in accordance with the law. The EIA report usually provides a detailed and rigorous analysis on which the authority can decide whether to approve a proposal and under which terms and conditions. Once a particular project is selected, it is monitored to ensure that conditions for approval are adhered to and that the benefits from the EIA are achieved. Monitoring, implementing and auditing within the EIA process provides feedback to further improve it.

assimilated into the requirements for EIA. A more comprehensive EIA could evolve towards a periodic vulnerability assessment to take into account the dynamic nature of vulnerability. An expanded EIA process could provide a basis to ensure that proposed initiatives would include considerations of both disaster reduction along with lessening environmental impact. Further it would allow for an assessment of potential problems as well as benefits of disaster risk reduction activities.

Additionally, disaster reduction specialists could use the EIA model as an example to increase comprehension of disaster impact assessments and to reorient it to become a plan-



ning tool. Fundamentally, a post event impact assessment is a reactive assessment of damage already occurred and not part of the planning process, although results can feed into future planning.

Further cross-fertilization between disaster reduction practitioners and environmental managers will generate better EIA techniques and practices for use in disaster reduction.

Investment in mitigation measures does not necessarily reduce vulnerability and the socio-economic and environmental consequences of such measures need to be assessed. A well designed EIA process incorporating disaster risk will be key in encouraging the private sector and individuals to consider how their own actions impact vulnerability factors. To end on a cautious note indicating that there is still a long way to go until EIA's potential is realized, a study carried out in MERCOSUR on the use of EIA showed that even though all countries had adopted EIA as a preventive environmental management tool, only Brazil had significant experience in this area. It is intriguing to note that emergency actions and actions that restore facilities to pre-disaster conditions are usually exempted from environmental impact assessment and documentation.

Examples of the integration of disaster reduction concerns into EIA are scarce. Through its EIA, the *Caribbean Development Bank (CDB)* is asking its borrowing member countries to include disaster mitigation measures that can serve to reduce the risk associated with investments in their development projects proposals.

In India, the regulation on environmental clearances for port projects requests an EIA report, an environment management plan, a risk analysis study and a disaster management plan. The regulation specifies that the disaster management plan should be prepared on the basis of the risk analysis considering worst case scenarios with respect to specific cases such as oil/chemical spillage, fire, explosions, sabotage and floods. It encourages green buffer zones whenever possible.

In Viet Nam, an environmental sustainability program in the framework of *Partnerships to Mitigate Natural Disasters (NDM)*, provides technical assistance for integrating environ-

mental considerations into natural disaster mitigation plans. The relationship between natural disasters and environmental degradation will be studied and guidelines for the environmental implications of disaster mitigation projects produced.

## Reporting on the state of the environment

Given the importance of natural resources as enduring ways to reduce disaster risk, it is vital to have a regularly updated picture of their health and ability to fulfil their buffering task. Some of the most relevant reporting agencies include:

- UNEP State of the Environment (SoE) reporting undertaken in the context of periodic Global Environmental Outlooks (GEO)
- IUCN environment profiles
- SoE reports for projects financed by the World Bank and GEF, as well as other funding agencies
- OECD environmental performance reviews
- UN CSD national reporting on implementation of Agenda 21, national assessment reports and country profiles
- National communications required by the Conference of the Parties of the climate change, biodiversity and desertification conventions.

The objective of these reporting systems is to assess the present and future situation of natural resources and the environment, including emerging issues on environmental management and legislation and development issues.

The objective of these reporting systems is to assess the present and future situation of natural resources and the environment, including emerging issues and recommendations on environmental management and legislation and development issues. They also inform on implementations means.

Reporting is a qualitative assessment tool and a framework for policy analysis and decision-making. Finally, reporting facilitates the measurement of progress towards sustainable development. Efforts of countries to meet their environmental and sustainable development goals are scrutinized in order to improve their performance in environmental management and

The **Bangladesh 2001 SoE** report prepared under the aegis of UNEP for GEO 2002 has a well developed and detailed section on natural disasters, which includes:

- General introduction on the types of disasters affecting the country
- Pressures on the environment that exacerbate natural disasters including geographical settings, physiography, hydrology and environmental pressures
- State of natural disasters: floods, cyclones, droughts, abnormal rainfall, hailstorms, lightning, tornadoes, earthquakes and erosion
- Impact of natural disasters: climate change, agriculture, salinity intrusion, fisheries, ecosystems and biodiversity
- Structural and non-structural responses
- Suggested options as future measures
- Conclusion

The report describes in detail the disaster management bodies and their main functions and responsibilities.

#### Excerpts from a table in the Bangladesh SoE report

Issue	Pressure/Cause	Impacts	Responses
Flood	Excess flow in monsoon Improper infrastructure development 92% of total catchment area across border Drainage congestion due to river bed siltation Deforestation in upper catchment area	Disruption of communications and livelihoods systems Loss of agricultural production Disruption of essential services National economic loss Loss of human lives and biodiversity	CDMP (Comprehensive Disaster Management Plan) FAP (Flood Action Plan) National Water Policy Flood forecast and inundation modelling Dredging of river bed Construction of embankments with sluice gates



develop principles, guidelines and effective strategies to better set their priorities.

Natural disaster concerns are more or less identifiable in the above mentioned reporting systems, links between environmental management and flood damage (e.g. lack of integration between water management, transport policy and nature conservation objectives) being most frequently described. However, they can produce essential baseline and vulnerability information on which to develop disaster reduction policies (see boxexample from Bangladesh).

#### **Economic incentives/disincentives for disaster reduction** include:

- Tax incentives, subsidies and loans to compensate landowners or discourage certain land uses
- User charges: fees for downstream beneficiaries (domestic water use, agriculture, hydropower, fishery, recreation)
- Transfer of development rights to avoid undesirable development
- Easements: legal agreement to restrict type and amount of development taking place on a property
- Land purchase/property rights: usually restricted for exceptional lands (restricted land leases)
- Fines/liability system for damages caused to human settlements or environmental services
- Pricing structures to discourage unsound use of resources

Existing reporting guidelines could easily be updated to include a requirement to systematically report on the environmental features and resource necessary to prevent environmental degradation that will lead to an increase in disaster risks. The process of environmental reporting could also be designed to contribute to the record of ways in which societies mitigate risk by cultural adaptation and their appraisal of natural resources.

Environmental mapping, in which community members are asked to locate relevant environmental features and resources on a self-created map of their territory, could be used for risk mapping. Maps representing physical features, such as roads, houses, soil types and vegetation, could include social and risk phenomena,

e.g., access to resources by specific groups or household wealth. Community involvement in map building provides an occasion to discuss resource management issues.

#### **Ecological and environmental economics**

It is essential to obtain an accurate picture of true health and wealth of the socio-economic and socio-ecological situation of a nation in assessing progress towards sustainable development. Of the three interactive spheres of sustainable development – social, economic and environmental/ecological – economic considerations, in many ways remains dominant, both in influence and in its measurement. Proving that disaster reduction integrating sound environmental management makes economic sense is a major challenge when confronting decision-makers.

Environmental economics, also referred to as ecological economics, provides a visible way to link environmental management and disaster risk reduction in sustainable development. It utilizes the tools and mechanisms of economics to measure in currency terms, the value and costs regarding various aspects of the environment such as well-functioning ecosystems, pristine environments, biodiversity and the costs associated with resource and ecosystem depletion.

In conventional economic frameworks, natural resources, in terms of their worth for human use, have been considered. Beginning in the 1970s, economic mechanisms began to be adapted in order to measure more accurate representation of the socio-ecological aspects of the community.

Until quite recently, the study of environmental economics has been predominantly in academia, related research institutions, in multilateral and bilateral organization and in the large international environmentally-oriented NGOs. As environmental issues become increasingly everyday news, decision makers world-wide have started to examine ways in which socio-ecological values and costs can be measured and incorporated into economic and political discourse. There are numerous national models, including the older forms of National Resource Accounts (NRA), National Systems for Environmental Accounting



(NSA) and the System for Environmental Economic Accounting (SEEA). These tools work to reduce fragmentation and overlap of activities that have often resulted in confused policies towards agriculture, tourism and environmental management. Additionally, they pose a unique opportunity to develop more robust indicators of sustainable development. Quantifying aspects of socio-ecological considerations are a huge challenge for risk reduction and environmental management practitioners alike, as is advancing these concerns from the back burners of economically oriented political agendas.

From a practical point of view, grants, funds, loan guarantees, investment partnerships, and environmental incentives are some of the tools countries can use to promote water management, hazard mitigation, environmental conservation, coastal zone management etc., that serve both environmental and disaster reduction goals. Money generated by trust funds for ecoservices envisaged under multilateral agreements can be injected in disaster reduction activities. The potential to use creative environmental debt reduction strategies can also be explored. Debt-for-nature swaps are used to protect crucial natural services and implicitly contribute to disaster reduction. Innovative thinking to combine debt-for-disaster reduction swaps and debt-for-nature swaps could be initiated. This would help the poorest countries implement disaster reduction activities as part of their poverty alleviation strategy.

To maximize the protection of environmental services for disaster reduction, the current situation of remedial payment, where environmental services are compensated for, should be changed to a system where such services are paid for. In **Costa Rica, Colombia, Ecuador, Guatemala and El Salvador**, projects financed by the World Bank introduce the concept of payments to obtain a variety of environmental services, including sustainable natural resource management, watershed and forests protection, conservation of biodiversity, reduced vulnerability to floods, improved water quality and reduced sedimentation.

## Environmental codes and standards

Coping with environmental and natural hazard risks will require better environmental and disaster risk management. Avoiding economic losses through improved proactive environmental management and performance is possible with the implementation of *Environmental Management Systems (EMS)* following procedures such as the ISO 14000 family of standards. The *International Organization for Standardization (ISO)* develops voluntary technical standards which add value to all types of business, administrations and public utilities operations. ISO 14000 is a set of generic tools for developing, implementing, maintaining and evaluating environmental policies and objectives. They contribute to making the development, manufacturing and supply of products and services more efficient, safer and cleaner. Organizations establish their policies, objectives and levels of ambition. These quality standards constitute a *responsible care* approach, which combines safety and prevention of technological disasters.

If upgraded to include disaster resistance, standards for EMS, including environmental auditing, life cycle assessment, environmental labelling and environmental performance evaluation could reinforce business imperatives, proving the case for applying ISO 14000 to disaster reduction.

ISO certification also provides an important basis for communication with businesses, government, financial organizations and environmental groups. We should add people at risk and the disaster community to this list. If the certificate provides information about the capability of the organization to achieve its stated environmental objectives, it has the potential to provide information on its capability to reduce vulnerability to disaster risk and achieve its stated disaster reduction objectives. Another benefit of certification is the scope for marketing. In the same way that we see green or environmental labelling, we could see disaster resilience labelling. Relevant work in this area has started in Australia, for example.



### Future challenges and priorities

From the issues described in this chapter, the main areas for action that stand out are:

- Exploration of the links between environmental degradation and changing hazard occurrence and vulnerability patterns.
- Identification and description of environmental knowledge and tools that can be applied to reduce vulnerability to risk.
- Economic valuation of environmental actions.

The identified knowledge and tools could then undergo modification and testing to be well adapted to case specific situations. Disaster and environment practitioners could apply the tools which would result in a greater sense of ownership and commitment. Capacities for use and

regular improvement of these tools would also be developed. To achieve this objective, development of a common language and exchange of practices and experience among experts in disaster risk management, environmental management, sustainable development and economics should be encouraged. In this regard, innovative forms of communication should be explored.

Some adjustments in policy frameworks to reflect this new approach to disaster reduction might be necessary. As would be close collaboration with institutions working on climate change adaptation, biodiversity conservation, land degradation, wetlands management, sustainable development and poverty alleviation. Finally, integrating risk management into environmental policy and vice-versa will require full community participation.

challenges

