



mitigation planning and implementation

gateway to disaster risk reduction

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Chapter Brief

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Chapter Brief

- Mitigation priorities are not only saving lives and injuries or reducing property losses but also reducing adverse consequences to economy and social institutions
- Where resources for mitigation is limited, they should be targeted where they will be most effective
- Mitigation measures are aimed at reducing or eliminating vulnerabilities in the community, and when sustained over long term, they can reduce unacceptable risk to acceptable levels and make a community become disaster resilient.
- Mitigation planning should aim to develop a culture of safety. Considerations in mitigation planning include, establishing a Disaster Risk Management Committee (DRMC) for brainstorming mitigation priorities based on risk assessment results and ranking mitigation measures involving stakeholder participatory process. After a disaster, the DRMC should meet and review the measures based on lessons learned from the disaster.
- Mitigation programming for a defined geographic area involves the preparation of an action plan for:
 - The implementation of mitigation activities
 - Deciding on mechanisms for implementation and
 - Monitoring and evaluation
- Mitigation measures include structural mitigation measures (engineered and non-engineered structures) and non-structural mitigation measures (physical planning, economic activities, societal measures, appropriate institutional arrangements)
- Building disaster resilient communities is a slow process and it should be supported by programs on professional training and education, and public awareness creation.
- Mitigation measures can be short term, medium term or long term. Community-based mitigation actions are likely to be more responsive to the needs of communities, cost effective and capable of mobilizing local resources

Introduction

Mitigation planning involves the preparation of an action plan for activities and, deciding on mechanisms for implementation and monitoring within a defined geographic area. The initiative may be taken by a local authority, or in some cases it may be a project, locally or foreign funded. For mitigating a specific natural disaster encompassing a broader geographic area, the provincial or state government, or a national ministry or authority may take the initiative.

The implementation and maintenance of mitigation measures:

- Improves development practices to increase resistance to future disasters
- Reduces or eliminates vulnerabilities in communities and other built environments
- Reduces unacceptable risk to an acceptable level

Implementation of mitigation measures can limit or eliminate future disaster impacts and is integral to a policy of sustainable development. The effort expended in the preparation and implementation of mitigation measures can make human settlements safer before a disaster and accelerate disaster recovery following a disaster.

The disaster risk assessment and evaluation process described in Chapter 3 identifies and assigns priorities to mitigation measures. The performance of mitigation must be evaluated following a disaster to determine if these mitigation measures achieved desired results. Performance evaluations provide information to improve mitigation efforts and revise mitigation priorities.

A mitigation plan provides a guide to the development and implementation of mitigation measures. The plan describes a process for incorporating changes in risks, mitigation approaches and mitigation priorities. The failure to prepare a mitigation plan exerts tremendous pressure on those involved in response and recovery efforts. For example, reconstruction projects to meet urgent housing needs may proceed without consideration of mitigation in



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order to move forward as quickly as possible. The mitigation plan provides guidelines to facilitate rapid recovery and prevent uncontrolled growth.

Some key points on mitigation planning to remember:

- Mitigation interventions integrated in all development programs to anticipate any hazard phenomenon will help to prevent emergencies becoming severe disaster events.
- The cost of integrating mitigation measures in development programming is minimum compared to implementing stand-alone projects. For example, mitigation can easily be adopted as a standardized component under Environmental Impact Assessment (EIA) processes.
- Incorporating mitigation into development projects targeting the most vulnerable can promote long-term poverty reduction strategies within the poorest segments of the community.
- If national policy can promote mitigation strategies and measures as part of development planning, this will set precedence for good governing standards.

Key Words



Avoidance

Many hazards are localised with their likely effects to specific areas, which are known to the planner. For example, floods affect flood plains and landslides affect steep slopes. Areas prone to landslides are generally known. The hazards can be avoided by not allowing settlements or important structures in prone areas.

Benefit/cost analysis

Feasibility studies of projects in hazard prone areas must include costs and benefits of investing in mitigation measures, in order to compare them with the value of losses that might be caused by natural hazards. The earlier these calculations are made the better. This integration can be done at different stages of the project development. During the feasibility and design stages attention must be given to:

- The impact of disasters upon the proposed development and;
- The impact of the proposed development upon the possible triggering of natural hazards in the area concerned.

Land use planning

Branch of physical and socio-economic planning that determines the means and assesses the values or limitations of various options in which land is to be utilized, with the corresponding effects on different segments of the population or interests of a community taken into account in resulting decisions.

Land-use planning involves studies and mapping, analysis of environmental and hazard data, formulation of alternative land-use decisions and design of a long-range plan for different geographical and administrative scales.

Land-use planning can help to mitigate disasters and reduce risks by discouraging high-density settlements and construction of key installations in hazard-prone areas, control of population density and expansion, and in the siting of service routes for transport, power, water, sewage and other critical facilities. (UNISDR, 2004)

Mitigation

Mitigation refers to structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards (UNISDR, 2004)

Non-structural Mitigation

Non-structural measures refer to policies, awareness, knowledge development, public commitment, and methods and operating practices, including participatory mechanisms and the provision of information, which can reduce risk and related impacts (*UNISDR, 2004*).

Prevention

For most types of natural disasters, it is impossible to prevent the actual event from occurring. The focus of mitigation policies against these hazards is primarily on reducing the vulnerability of elements that are likely to be affected. Some natural hazard risks can be reduced. The construction of levees along a riverbank is an example of prevention by flood risk reduction.

Risk Transfer

A measure by which non-affected population of a country assists the affected people with risk finance by way of insurance or catastrophe fund.

Structural Mitigation

Structural measures refer to any physical construction to reduce or avoid possible impacts of hazards, which include engineering measures and construction of hazard-resistant and protective structures and infrastructure (*UNISDR, 2004*).

Sustainable Development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs. (*Brundtland Commission, 1987 in UNISDR, 2004*)

Sustainable development is based on socio-cultural development, political stability and decorum, economic growth and ecosystem protection, which all relate to disaster risk reduction. (*UNISDR, 2004*)



Mitigation Planning and Implementation Concepts

Benefits of mitigation

Disaster impact adversely affects sustainable development.

Mitigation measures reduce or eliminate vulnerabilities in the community, and when sustained over the long term, reduce unacceptable risk to acceptable levels and make a community more disaster resilient. Mitigation includes what is commonly referred to as “prevention”. But not all hazards can be prevented.

Mitigation actions link disasters and development positively. Development projects with correct address to risk reduction contain components, which mitigate future disasters.

Proactive actions to reduce the impacts of hazards can reduce:

- Negative influences of disaster losses on the overall development indicators of a country (growth rate, per capita income, investment inflow, exports, share capital so on).
- Exhaustion of national resources for relief and rehabilitation work, which could otherwise be channeled into development work.
- The human misery, psychological trauma and other societal impacts of disaster.

Considerations in Mitigation planning

Appoint a Disaster Risk Management Committee

Identify members of the Disaster Risk Management Committee (DRMC), which will be responsible for developing and implementing the plan. Potential members should include those involved in the construction process (engineers, contractors, building officials, builders, facility managers, etc.) and appropriate government representatives (public safety, public works, community development, etc) and representatives of other key-stakeholders.



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Identify Mitigation Measures

Identify mitigation measures using the results of the risk assessment as described in Chapter 3, which includes the identification of:

- Potential hazards
- Elements at risk
- Vulnerabilities
- Potential mitigation measures



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Policy, Legal Arrangements and Institutional Frameworks

In order to address mitigation measures as identified using the information gathered during the risk assessment in Chapter 3, formulate policies (based on contents presented in Chapter 2) that would:

- Propose legal arrangements (laws, regulations, official acts, guidelines, etc) to implement selected mitigation measures and;
- Establish institutional framework necessary to carry out the defined mitigation policies.

Ranking mitigation measures

The mitigation plan should include a description of how mitigation measures will be ranked as per a pre-defined rationale giving justifications for the prioritization. Development of a criteria for the ranking based on the information in the risk assessment is also essential. This provides a predefined, equitable means to select appropriate measures.

Public involvement

Mitigation measures should be identified and prioritized through a participatory process. This can easily be done in a small geographic area, however when it is carried out at city, district, or even national level there are some limitations. Public meetings can be held to involve the community in the process of selecting mitigation measures. This provides an opportunity to review the results of the mitigation plan.

Revisions

Following a disaster, the Disaster Risk Management Committee should be reconvened. This allows review of the list of prioritized mitigation measures. Revisions are made based on lessons learned from the disaster. In addition, measures implemented before the disaster should be evaluated to see how well they performed.

Mitigation Measures

Mitigation measures may achieve any one of the following:

- Preventive measures, which aim to minimize the physical damage created by hazard events.
- Spreading the risk, which aims to reduce the effects of physical damage by ensuring a range of alternative facilities.
- Delegating the responsibility, which aims to provide an incentive for different agents to implement mitigation measures.
- Covering or minimizing the impact, which aims to manage potential effects.
- Planning disaster management, which aims at long-term resilience.

Structural mitigation

A few generic structural mitigation options

They are given below for clarity. Note that this list is not exhaustive. They are given below for clarity. Note that this list is not exhaustive.

- **Dams and dikes.** These man-made structures include the construction of levees and dikes to retain flood waters. Other types of intervention are dams and reservoirs to harness the flow of rivers, for flood control, irrigation and hydro power. However these methods may not provide the level of protection intended.
- Another mitigation technique employs structural measures to **strengthen buildings and facilities.** These measures can take place at original construction, during renovations, or as specific retrofit projects.
- Another mitigation technique is the **elevation of structures** within identified flood hazard areas.



The following structural and non-structural means may be listed (*Carter, 1991*):

Structural mitigation

- Engineered structures
- Non-engineered structures

Non-structural mitigation

- Legal framework
- Land-use planning
- Incentives
- Training and education
- Public awareness
- Institutional building

Elevation of homesteads and roads above maximum recorded flood level in Bangladesh, called **flood proofing.**

Structural mitigation for floods also ensures **adequate size of culverts, and other drainage devices** built to control of floodwaters, and bridges to ensure access over flooded areas. Drainage is a major problem in flood plane Bangladesh. Improvements to old drainage systems and introduction of drainage pipes in areas experiencing population growth can reduce the level and duration of inundation. A minor structural intervention in a community-based initiative in Bangladesh has lessened the severity of flooding in these growing urban environments.



A low cost bridge built through community based action in Cambodia.



When considering structural mitigation, there are two categories of buildings viz., engineered structures and non-engineered structures.

Engineered structures

These are the structures (e.g., buildings, bridges, communication towers, dykes/dams, sluice gates etc) designed and constructed according to standard engineering practices. Engineered buildings are generally designed and supervised by a professional engineer/s who must obtain a building permit from the municipal or other designated authority. The building permit, plan review and construction inspection by the local jurisdiction helps ensure that the building meets building code requirements and planning by-laws. This process does not ensure that the building codes are adequate or that engineers have received appropriate training. In most developing countries in Asia, the formal design and construction process is observed only in urban areas, but the process may need to be improved to protect lives and property from disaster affects.

**Non-engineered structures**

These are physical structures (e.g., buildings) that have been built without consideration of the design and construction standards that engineered structures must address. These structures have not been through a formal building permit process to ensure conformity with local building codes and land-use regulations. Such codes and regulations may not have been adopted. Neither have those responsible for construction received any guidance or supervision from the building department or professional engineers. Non-engineered structures are prevalent in rural and non-urban areas, such as the periphery of municipalities. A large percentage of the buildings even in urban areas of many developing countries are non-engineered constructions. For example: dwelling houses, rural infrastructure etc...

Mitigation strategies for non-engineered construction include:

Preparation of necessary documents

- Mandatory rules of thumb
- Design guidelines
- Mason's manual
- Preparation of leaflets, posters and a handbook

Raising awareness

People and house owners should be aware about the consequences of disasters, necessary actions for mitigation and also the affordability of the technology.

Training of artisans

Masons or craftsman should be trained through on-the-job training so that they would ensure safety of structures.

Development and transfer of appropriate technology

In case of earthquakes non-engineered buildings suffer most. Theoretically, if appropriate resources and building materials are made available, such buildings can be constructed to withstand the effects of earthquakes. Practically, it is not feasible to do so due to very high costs involved. Engineering advice is essential to achieve the cost effectiveness and optimization of resources without compromising on safety standards.

The safety aims would be met, if a building could be designed and constructed using appropriate technology in such a way that even in the event of the probable maximum impact of disaster, it will remain functional.

Non-structural mitigation

Institutional measures

A legal framework supported by an appropriate institutional arrangement is a necessary platform for implementing disaster mitigation. It is a non-structural measure that demonstrates a clear lead from government, provides legislation and regulations, provides organizational arrangements with clear delegation of roles and responsibilities, and provide for a vision of expected standards.

A legal framework and its implementation is lacking in most countries throughout Asia. Good governance and commitment to risk management is a challenge for most national governments in the region.

An example of the use of a legal framework is the implementation of building codes that set standards for new construction to withstand the impact of natural hazards such as cyclones or earth quakes.

Land-use planning

Land use planning helps in controlling human activities in hazard prone areas to avoid damage to infrastructure, and loss of life and injury. Land-use planning addresses the changing relationship between people and their environments. It is a useful approach to managing urban population growth and minimizing risks.

The process involves the active participation of land developers, local governments and the community. Due to decentralization of governance throughout Asia, local government needs to take a major role in the planning of land use in their constituencies. Of late, there has been a greater emphasis on wider community consultation in land use planning.

Regulatory mechanisms addressing disasters have proved effective in developed countries such as Australia, Switzerland and the USA, but in Asia, land use planning is rarely practiced. In Asia, creating a regulatory environment for effective implementation of land-use planning poses a challenge.

The other challenge is the lack or inability to access, and reluctance to share information regarding hazard characteristics, vulnerability and risk. The case study of Naga City highlights the benefits that can result from good land use planning.

Broad categories of land use:

- Residential
- Agricultural
- Religious & cultural
- Recreational
- Conservation
- Forests
- Commercial
- Medical
- Administrative
- Industrial /Airport
- Employment center
- Business center



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Land use planning legislation that governs risk mitigation

Zoning Regulations. Zoning is the way the governments control the physical development of land and the kind of uses to which each individual property may be allocated. Zoning regulations should be based on detailed risk analysis including development of risk scenarios, risk projections and risk micro-zonation. Local authorities should implement it in consistency with a comprehensive Area Development Plan.

Acquisition and relocation. The acquisition of land identified as a hazard prone area is another land use planning technique. In some cases, human settlements prone to flooding can be shifted and relocated to higher ground nearby. Such hazard prone land is usually allocated for passive land uses, such as open space sometimes suitable for parkland, children's playgrounds, sports fields, retarding ponds and retention areas; depending on the severity of flooding.

Sub-division Regulations. It is the division of land into two or more parcels for the purpose of sale or building development. Subdivision regulations are a useful legal tool for controlling development and maintaining accurate records of land titles through taxation. The main benefit is that these regulations enable the authorities to follow a consistent policy.

Building Regulations. Buildings in disaster prone areas are likely to be subjected to abnormally heavy stresses, varying based on the types of hazards that occur in that region. Accordingly, buildings need to be built to certain varying specifications in order to combat the stresses.

Economic measures

Incentives and disincentives. Incentives as well as disincentives or penalties can be used as economic measures to promote or control development in hazard prone areas. Loans, incentives tax concessions, grants can be used to influence decisions communities make to reduce the disaster risks by attracting them to safer areas. Tax, fines, and penalties can be used as financial tools to discourage people moving in to hazard prone areas.

People need encouragement to actively participate in mitigation activities. Whether they are government officials, construction specialists or the general public, legal mandates, legislations and policies are not always adhered to. However, incentives in the form of government grants or subsidies may help to persuade institutions both public and private to include mitigation

Catastrophe Insurance penetration in developing countries:

India - under 0.5%
The Philippines - under 0.3%
Iran - under 0.05%
Romania - under 5%
Bulgaria - under 3%
China - under 0.5%
Turkey - 17%

Compared to the developed world situation, much has to be done to encourage insurance penetration in the developing world.

measures into such activities as planning, building and construction.

One form of incentive relatively new to disaster management in developing countries is insurance. It is an area of potential growth that can spread the financial burden of disaster risk. This financial instrument involves private and public sector cooperation. Different systems need to be experimented on a small scale over short periods of time to pilot what works best and learn from the experience.

Professional Training and Education

Professional training and education provides the foundation for disaster resistant communities. There is a need to involve government officials working directly in disaster management, as well as engineers, construction specialists, builders, architects and land use planners. The first step to improve professional training and education is the delivery of a variety of training and education workshops, seminars, workbooks, text books, etc on the need for mitigation and how to incorporate mitigation into the building process. These professionals can explain the importance of mitigation to their clients.

Some desirable components in training and education are indicated below.



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Development**
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Professional Training and Education

Government Officials

Appropriate modules or programs in specialist areas associated with their particular sector that would help career pathways. Strengthening of national or community capacity to lead and deal with disasters. This can work through identifying and strengthening organizations that serve as coping mechanisms: by increasing capacity and skills to face a crisis. · Increasing the number of coping mechanisms within a country or community and linking them to outside resources; and, encouraging actions that promote cooperation among different government ministries, departments, programs, etc.

Construction Specialists

On the job training for structural mitigation measures. Special training programs and guidelines that detail hazard specific mitigation practices.

Planners

Professional education, in disaster risk management courses that include theory and practice.

Tertiary Students

Include modules and subjects directly related to disaster risk management that contain both theory and practice associated with their disciplines.

Building Maintenance Staff

Include training for building maintenance staff on steps to take to reduce potential hazard damage, such as fixing of non-structural elements such as fans, cupboards, furniture etc... in earthquake hazard prone areas.

Public awareness

Public awareness campaigns generate community support for the implementation of mitigation actions and encourage those engaged in the building profession to address mitigation. The importance of public awareness and social marketing must be realized. Informing the general population about the potential hazards and risks increases public knowledge and understanding of the situation. Risk communication can encourage greater public participation in mitigation activities, enhancing the effectiveness of preparedness and prevention planning. Campaigns need to be targeted to specific audiences with directed messages.

Introduction to natural disasters and their potential impact on the community provide long-term opportunities to include public awareness. For example, the involvement of school children through art competitions, participation in disaster reduction campaigns and events, and meeting with people involved in disaster mitigation are among many tools that can be used for this purpose.

Institutional building

This is the strengthening of national or community capacity to lead and deal with disasters. This can work through identifying and strengthening organizations that serve as coping mechanisms, by increasing capacity and skills to face a crisis, namely:

- Increasing the number of coping mechanisms within a country or community and linking them to outside resources and;
- Encouraging actions that promote cooperation among different groups within society.



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Allocation of funds for mitigation projects

Ideally, if mitigation is considered an everyday component of development planning, budgets at national down to local level government should set aside funds for risk management. However, this is the exception rather than the rule. The importance of budget allocation for mitigation interventions is illustrated in case study on *Government fund allocation for disaster relief, preparedness and mitigation in the Philippines*.

Mitigation Approaches

A generic list of available options to prevent risk

- Carry out audit of all infrastructure using city zonation maps to identify elements at risk.
- Identify key components of each system, particularly in installations and buildings of post disaster significance and infrastructure linking them. Nominate strategic components for upgrading or re-routing away from vulnerable areas.
- Upgrade all vulnerable strategic structures.
- Design, detail or retrofit systems where it is impossible to avoid hazard-prone areas to minimize the effects of hazards and enable a rapid return to normal operation.
- Review design standards, specifications and good practice guides. Revise them according to the priority of the component and the level of finance available.
- Provide protection for sensitive plant and equipment. For example, raise items above flood or surge level, fix and brace freestanding equipment in earthquake areas, insulate computer hardware and control equipment from the effects of volcanic dust.
- Keep records on a database secure from damage, and ensure that maps of primary systems and district-by-district records of secondary systems are retained and accessible to users.

Spread the risk

- Avoid dependence on single facilities and transport routes.
- Introduce redundancy or reinforcement into the distribution system for re-routing operations (advisable to safeguard supply during major repairs). For example, city water or electricity supplies.
- Provide alternative sources of electricity supply



Spread the responsibility

- Widen ownership of the system, particularly for maintenance and operation, under regulatory control.
- Help informal communities to install and manage local systems, subject to regulations on minimum standards for security and quality of supply.
- Encourage user participation by promoting public & private partnership in community-based projects utilizing forms of concession such as BOT (build/operate/transfer) or BOOT (build/own/operate/transfer).

Cover or minimize the impact

- Establish procedures for system failure and minimizing the effect of pollution.
- Encourage strategic users to install and regularly test standby power-generation equipment and ensure that there is adequate fuel for, for example, 30 days continuous operation.
- Hold spares to replace critical items.
- Provide insurance for physical losses, particularly for mechanical and electrical plant, to facilitate rapid decommissioning of the system.

Plan disaster risk management

- Plan to minimize the time taken to return to normality
- Arrange regular workshops and training programs for the continuing education of staff in hazard preparedness and mitigation.
- Promote hazard awareness and the planning of facilities away from vulnerable areas.

Mitigation Planning and Implementation Process

The disaster risk management committee or the partnership responsible for the mitigation initiatives should 'brainstorm' on all possible measures that might help to reduce risk. The alternatives should be weighed and the more acceptable ones selected which are appropriate to satisfy community needs. Then a plan must be formulated to facilitate the implementation of the selected risk reduction measures. A focal point must be identified to coordinate, develop, implement and revise the plan.



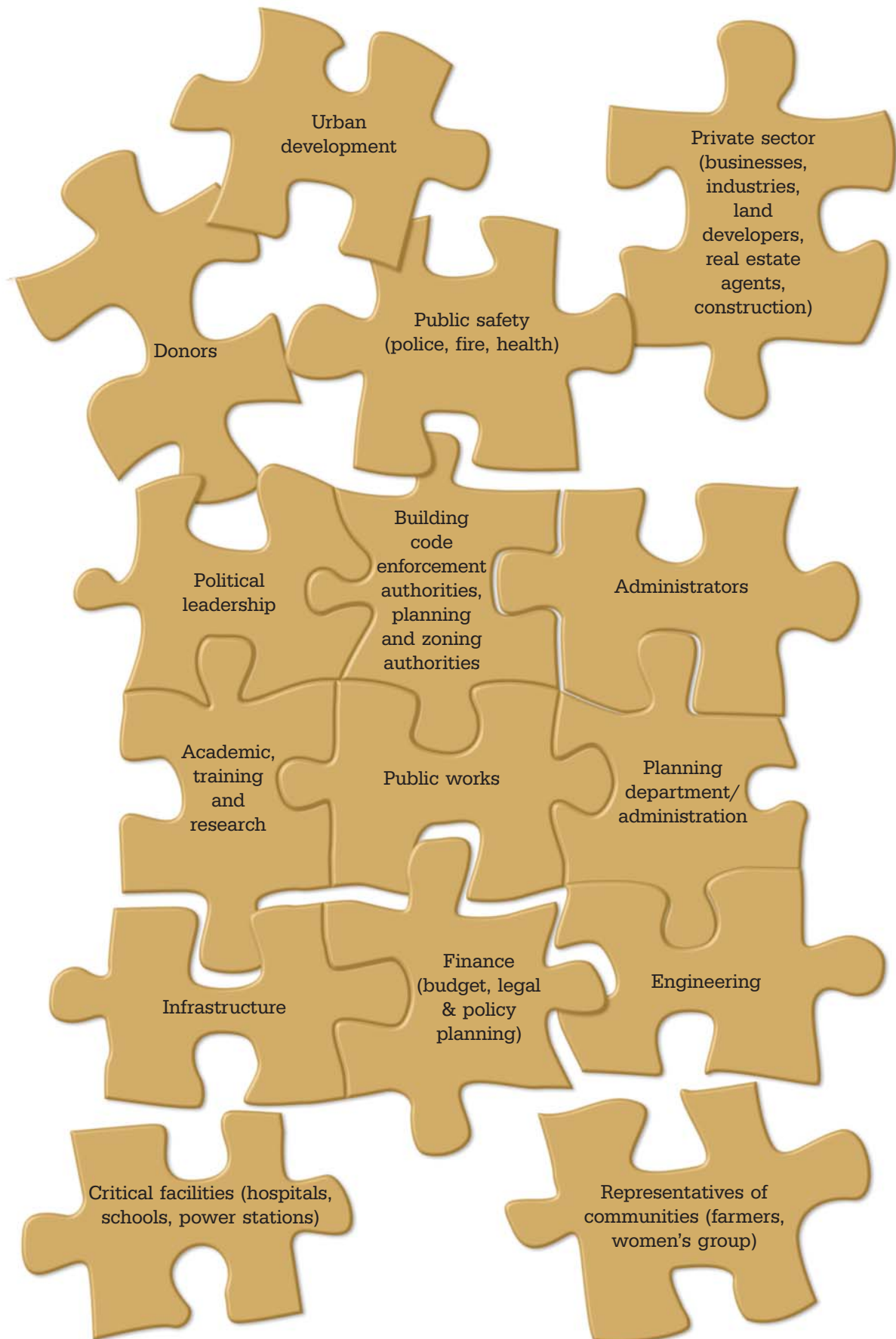
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An overview of mitigation planning and implementation process

- Hazard identification in the planning area and analysis
- Vulnerability and risk assessment
- Action planning and identification of mitigation interventions
- Prioritisation
- Implementation of mitigation interventions
- Monitoring and evaluation
- Review and revise the plan

Who should be involved in planning process?

As mitigation is a multi stakeholder activity, it is desirable that representatives from the following organizations should be involved in mitigation planning:



How should this plan look like?

A basic outline is given below. This is not a universal format but points to major items that must be included in a mitigation plan.

Components of a mitigation plan

Introduction

1. The reason for developing mitigation plan
2. How it was prepared
3. Who was involved

Problem description

For each hazard provide

1. Hazard description
2. Impact on property
3. Impact on human life, injury and health

Community considerations

1. Economic development
2. Environment
3. Future needs
4. Other considerations

Goals and objectives

Proposed risk reduction measures

For each include

1. Description
2. Objectives supported
3. Who is responsible?
4. When it must be done?
5. Who can help?
6. Budget

Implementation and Evaluation

1. Implementation schedule
2. Monitoring (How? Who? What?)
3. Evaluation (How? who? Scope? When?)

Five “M” s for Mitigation Planning

Multi-stakeholder. While the development of a plan at its minimum may involve a small number of disaster managers or other specialists, ideally mitigation or disaster risk reduction planning is a priority-setting and partnership-building exercise to coordinate the efforts of multiple agencies and levels of government and society.

Multi-phase. These plans have various names to reflect their particular emphasis - mitigation action plan, disaster reduction plan - all reflect an emphasis on pre-disaster activities to manage risk and reduce the impact of future disasters. Some may include preparedness activities, such as the development of emergency response plans, although the term mitigation plan may refer specifically to plans for mitigation as distinct from preparedness or emergency response (*Moga, 2002*).

Multi-hazard. Some plans may focus on the mitigation of a specific hazard (e.g. flood), although a multi-hazard approach would be more effective since risks are often multi-hazard in nature. A flash flood often triggers landslides or it may disperse toxic materials; and earthquake may cause fire and tsunamis. Planning must be based on a risk assessment.

Multi-jurisdiction. It is important to define the area(s) for planning. Local government most often create a plan that covers their political jurisdiction, be it province, municipality or city. In many instances, however, a multi-jurisdictional approach is useful for cities in the same watershed, as in the above case study or for towns located along the same earthquake fault zone.

Multi-task. Planning process involves continuous implementation, monitoring, review and revision of the plan to reflect the changing situation and needs of the area(s).

Rationale for a good mitigation plan

A good mitigation plan shall be a plan developed recognizing the:

- Technical acceptance and feasibility of activities/interventions under all circumstances
- Capacity of implementing institution or its potential for adaptation
- Positive environmental impacts the interventions can bring
- Cost effectiveness in the short and long term
- Social acceptability and compatibility with farsighted community values and social ethics
- Acceptance of political leadership for adaptation
- Existing legal authority or possibility to create conducive environment in line with legal provisions.

(Action Plan, SLUMDMP, 1999)



CASE STUDIES

India

Projected Benefits of Mitigation

In 1977, a cyclone struck the Andhra Pradesh in India. The following loss figures were estimated for the East Godavari District.

Houses destroyed	289,906
Houses damaged	89,677
TOTAL	379,583
Persons rendered homeless	1.442 million

If mitigation measures were taken to strengthen houses by retrofitting, the loss would have been reduced as follows.

Houses destroyed	Nil
Houses damaged	136,489
Persons rendered homeless	0.519 million

The economic benefit is estimated to be Rs. 91 crores. The estimated economic benefit highlights the difference between response and mitigation. Response work is reactive and begins after disaster impact. It usually redirects resources from potential investments in development. Mitigation on the other hand is ideally proactive and decreases the impact. Resource for mitigation activities are an investment in sustainable development.

Source: Gujarat, Vulnerability Atlas of India, 1997



India



Vietnam

The Importance of Policy Environment

One of the initiatives under this strategy is the shift in the traditional cropping schedule so that the summer-autumn crop is planted earlier before the flood season. There are normally two rice crops cultivated each year. Crops are sown in February and July, and harvested in March and November. If conditions are favorable for a third crop, farmers will attempt to increase their yearly yield. Flood season falls between August and November, coinciding with the growing season, thus risking crops to flood damage. To avoid peak flooding, but still utilize optimal flood conditions for rice cultivation, the Government of Vietnam banned the planting of the third crop and



Vietnam

changed planting months to November and April, and harvests to March and August. In addition, enhanced mechanisms for cutting and thrashing and the promotion of short-duration varieties have all resulted in reduced crop damages in the Mekong River Delta.

Farmers in the delta provinces now plant the summer-autumn crop earlier to avoid floods and have taken advantage of floods for fish breeding and harvesting of aquatic plants for food and shelter.

The Government issued decision No. 668/TTg on 22 August 1997 on the guidelines and measures to mitigate disaster risks in Central Vietnam. Programs included: 5 million hectares forestry program; construction of transportation infrastructure; constructions to protect riverbanks, and; the strengthening of schools, health clinics and offices.



Philippines

Naga City, The Philippines Non-Structural Disaster Mitigation

Philippines

Flood-prone Naga City of the Philippines has developed a range of innovative initiatives to incorporate disaster risk reduction as part of the development process. In Disaster Mitigation Planning: With support from ADPC and USAID, the city government developed a disaster mitigation plan, endorsed by the city mayor. The plan guided development activities of Naga City. Strategies for land use planning, safer construction, resources mobilization, capacity building and cooperation emerged from a risk assessment developed using GIS.

In Land Use Planning: Under its successive five-year development plans and its comprehensive land use plan, the city government has gradually shifted the focus of economic activity from the flood-prone central business area to safer areas of the city. One initiative is the Panganiban-Diversion Growth Triangle.

In Building Code Enforcement: The city government has developed its own building ordinance by adapting the national building code to the local context and using UN-HABITAT's guidelines on settlement planning in flood prone communities. This initiative allows the city government to prosecute violators without direct involvement of the national government.

In Forming Partnerships: Mitigating floods within Naga City calls for solutions well beyond its boundaries as the Bicol River snakes

through two provinces and dozens of municipalities. Through Naga City's partnership with 14 neighboring municipalities, collectively known as the Metro Naga Development Council, cooperation in mitigating flood on a basin-wide basis is made possible.

In Capacity Building: As part of the disaster mitigation plan, the capacities of city planners, city government officials, barangay (district) officials, non-government organizations and schools are being built in a continuous basis with support from a range of organizations including the Naga City Government, ADPC and USAID.

(Elcamel, 2002)

Bangladesh

Micro-Financing for Floods

Undeniably, low-income vulnerable communities need access to financial resources to contribute to household level disaster mitigation measures. Investing in the pre-disaster cycle can reduce the vulnerability of households to natural disasters (Parker and Nagarajan 2000). Micro-finance has the potential to provide an informal, flexible financial instrument to the vast majority of low-income communities. Yet this is a relatively unexplored option for the poor.

The 1998 floods in Bangladesh revealed the important role micro-finance plays in the relief and recovery phase. However, concerns have been raised in regard to the financial burden this places on Micro Finance Organisations (MFOs). A combination of the increased number of MFO clients requesting withdrawals and loans, and the inability of existing clients to make repayments and installments posed a liquidity problem for even large MFOs such as BRAC, Proshika and the Grameen Bank. Up to 60% of loans cannot be recovered, and portfolios were reduced by up to 50% (*Nagarajan 1998*).

Development finance programs should consider disaster risk as important in developing its financial products. This leads to the establishment of development funds giving incentives and resources to motivate household and community level structural and non-structural mitigation measures.

As a disaster prevention and risk measure, new loan products were developed and aimed at reducing the exposure of clients to disaster related losses. The Bank of Bangladesh, through a network of government sponsored MFOs now provides 10 year long-term loans for clients in flood prone areas.



Bangladesh

1. **Boat Scheme.** Loans for boats as an income generation investment during normal times for fishing and transporting people were developed. During disaster times, the boat owner is obliged to use the boat to transport people and their belongings to higher ground (*Brown and Nagarajan 2000*).
2. **Structural Flood Mitigation.** By allocating a certain percentage of client's funds, MFO's began to build drainage, flood evacuation shelters, and raise roads at the community level. Shelters were to be used for income generating activities during normal times (*Brown and Nagarajan 2000*).
3. **Flood Resistant Housing Loans.** The Bank of Bangladesh has initiated loan funds to support MFOs to provide long-term loans for the construction of flood resistant cement and tin housing (*Brown and Nagarajan 2000*).



Vietnam

Vietnam

Linking Response and Recovery to Mitigation and Development

Like many countries, disaster management in Vietnam meant distribution of food, water, medicine, seeds, concrete poles and iron sheets to disaster-affected families. However, the small gains from these short-term and stand-alone projects are wiped out during the next disaster.

Following the devastating flood of 1999 in Central Vietnam, the Government of Vietnam, donors and NGOs jointly expressed the wish to move away from short independent projects to collaborate in identifying needs, priorities and projects, and making best use of available resources. This led to the establishment of the Natural Disaster Mitigation Partnership (NDM-P), an institutional arrangement to formally facilitate cooperation and coordination in disaster response, recovery, preparedness and mitigation for Central Vietnam (with plans to expand this initiative nationwide).

A government and multi-donor joint assessment led to the identification of a range of priority projects for Central Vietnam. A number of government departments, international agencies, donors and NGOs are signatories of a Memorandum of Agreement to include these priority projects as part of their development strategy.

The Royal Netherlands Government, Government of Luxembourg and UNDP are, through the NDM-P, supporting pilot projects in Binh Dinh Province and Da Nang City. The projects are designed to be implemented by national, provincial and local government

departments with technical assistance and capacity building by NGOs and international agencies.

An NDM-P Secretariat provides support in improved coordination and collaboration. Some of their ongoing initiatives include:

- Serving as a clearinghouse for information related to disaster risk reduction in Vietnam.
- Developing a mechanism for coordinated rapid risk assessment immediately after a disaster, including standard report formats and forms to assess: shelter; child protection; food security; nutrition and livelihood; health; water; sanitation; and education.
- Facilitating information sharing and capacity building through meetings, training seminars, a website, a quarterly newsletter and an electronic mailing list.
- Facilitating collaboration between funding agencies and implementing agencies in the implementation of priority programs.

Source: For more information visit <http://www.undp.org.vn/ndm-partnership/NDM-Partners.htm>

Nepal

Non-Engineered Structures in Kathmandu

In the urban areas of Kathmandu, Nepal, it is estimated that more than 90 percent of existing building stock are non-engineered (partly because there are many old historic buildings), and every year about 5000 more such non-engineered buildings are added. To suit the resources and capacities available, non-engineered mitigation activities have been implemented.

Mostly these buildings are owner built without application of appropriate construction technologies and using poor quality construction material. Even workmanship is observed to be poor. Local NGO, National Society for Earthquake Engineering Technology (NSET) of Nepal has undertaken a program to train masons and other artisans to provide skills on appropriate technology. Also NSET used to demonstrate the appropriateness of retrofitting and strengthening of buildings through shake table demonstrations in public forums such as exhibitions with the view to create awareness on appropriate technology.

Source: NSET - Nepal



Nepal

**Bangladesh**

Bangladesh

Long-Term Structural Mitigation

The devastating floods of 1987 and 1988 spurred the Government of Bangladesh to consider long-term approaches to flood mitigation. With the financial and technical assistance of multilateral and bilateral agencies, the Flood Action Plan (FAP) was developed. Coordinated by the World Bank at the request of the Government of Bangladesh, the plan comprised of 26 different components contributed to buy 15 donors.

Phase 1 was conducted between 1990-1995 and consisted of the following aims:

- To establish the principles and criteria for sustainable flood mitigation
- To undertake comprehensive planning studies
- To begin the implementation of high-priority projects

Mainly focusing on flood plain studies and trial pilot projects to identify appropriate measures. The objective was to identify potential long-term structural mitigation projects for donor funding. The FAP advocated a controlled approach to flooding in the rural areas, and flood protection measures in urban areas.

The results of the FAP found the use of embankments to cordon and redirect flood water, an accepted method of structural mitigation. The Greater Dhaka Embankment Project was the result of the feasibility studies conducted under the FAP. This huge, long-term and costly project was implemented by the Bangladesh Water Development Board (BWDB), Dhaka Water Supply and Sewerage Authority, and the Dhaka City Corporation. It attempted to address associated urban flood issues such as excess rubbish, sewage, drainage, water logging and dredging.

To date, it has been one of the most expensive and controversial projects. Critics blame the inundation in the north of Dhaka, the resettlement and displacement of largely poorer communities, and increasing debt, on the construction of the embankment. Recent flooding in 2004 leaving Dhaka at a standstill twice during one monsoon season for long periods of time have been blamed on the approach to flood control supporting the construction of the embankment.



The aim of preventing flooding in a fast changing urban metropolis by confining and channeling water, thus cordoning certain parts of Dhaka from inundation remains a contentious issue for Bangladesh. The embankment itself has not been as successful as first envisaged, and perhaps the flood 'protection and control' approach contributed to the impending problems Dhaka now faces. Yet, this does not spell the end to long-term structural mitigation. New studies and approaches that can use the rivers rather than block them may be the answer in the future.

Nepal and Indonesia

Strengthening Existing Structures

Another mitigation technique employs structural measures to **strengthen buildings and facilities**. These measures can take place at original construction, during renovations, or as specific retrofit projects. Some hazard specific examples are given below.

There are hazard specific guidelines for building in hazard prone areas to reduce damage from impact. Many of these measures can be done at any time within the life of a structure, not only during new construction. However, it's much more cost effective to do it at the time of a new construction.

The school retrofitting initiative under the Kathmandu Valley earthquake Risk Mitigation Project (KVERMP), Nepal, under the Asian Disaster Mitigation Program (AUDMP) of ADPC, Bangkok used bandages of reinforcement materials to strengthen and tie together wall units.

In Bengkulu, Indonesia, the Indonesian Urban Disaster Mitigation Project (IUDMP) under the Asian Urban Disaster Mitigation Program, ADPC, Bangkok, with the expertise of Teddy Boen carried out an innovative retrofitting scheme, which involved only selected components of the building prone to damage thereby saving much cost.

(safercities 4 and 10)



**Nepal and
Indonesia**

**Philippines**

The Philippines

Government Fund Allocation for Disaster Relief, Preparedness and Mitigation

At national level, the Local Calamity Fund (LCF) mandates 5% of the national revenue from real property tax, and licenses to be allocated for disaster relief at the municipal government level. This budgetary allocation cannot be used for disaster preparedness. However, the decentralisation of national government responsibilities to Local government Units (LGUs) through the 1991 Local Government Code has enabled municipal level governments to consider preparedness and mitigation.

Supported by the Presidential Decree No. 1566 to 'Establishment of a National Program on Community Disaster Preparedness', salient provisions for the management of disasters have been taken up by municipal level government. 20% of the 40% internal revenue allotment to the Local Government Units (LGU) from the national government is used for development projects. Called a Development Fund, LGUs have assigned some of these resources for disaster preparedness and mitigation activities.

As the development needs and the expenditure demands of natural disasters vary, each LGU is able to decide how to direct and secure resources to plan and manage disasters in selected sectors.

The Municipality of Dumangas has taken steps towards improving their disaster management by mobilising their development fund for municipal and community level preparedness and mitigation activities.

The allocation of funds is not dependent on disaster risk and vulnerability so some LGUs are still unable to develop and implement sufficient preparedness and mitigation projects. Yet the Philippines experience is a step in the right direction. The ability to secure resources, and devolve responsibility has successfully promoted the integration of disaster management through all levels of national planning and development.



China

Flood Insurance in China

China has experimented with the use of flood insurance through government assistance and by making participation in this scheme compulsory in the piloted area.

From 1986 to 1996, the Ministry of Water Resources, Ministry of Finance, Ministry of Civil Affairs, People's Insurance Company of China and Anhui provincial government jointly implemented, on a trial basis a flood insurance scheme. Participation was compulsory - the central and provincial governments bore 70% of the cost of premiums and the affected persons the remaining 30%. At the end of the trial period, it was found that insurance helped raise people's awareness of flood risk and the need to manage flood for the greater safety of the community. The compulsory payment of premiums and the inclusion of a cap on the amount of compensation which insurers are required to pay, however, act as disincentives to investment in high-risk areas.

(Dang, Q.T. & Pham, T.H. 2003; Elcamel, E., 2002; ISDR, 2002)



China



Lessons Learned

- Usage of resources for mitigation activities is an investment for sustainable development.
- Conducive policy environment helps good decision making at top government level resulting in benefits such as improved infrastructure, built environment and other disaster risk reduction initiatives
- Development and implementation of a disaster mitigation plan result in good strategies for land use planning, safer construction adopting relevant building codes, resource mobilization, capacity building and partnerships.
- Micro-finance has the potential to provide an informal and flexible financial instrument to low-income communities for risk reduction activities such as loan schemes, structural mitigation for infrastructure and flood resistant houses.
- Initiatives for strengthening buildings and structures can take place at original construction, during renovations or as retrofit projects, but are most cost-effective at the time of new construction.
- Institutional arrangements facilitating cooperation and coordination allows for identifying and prioritizing disaster mitigation initiatives more effectively.
- Costly long-term mitigation projects need elaborate studies and multi-disciplinary, multi-stakeholder dialogue prior to finalization.

Discussion Questions



Have you composed your Team?

Putting together a good team is important. Plan development will succeed smoothly only if the right people and organizations are involved.

The planning team needs to include those:

- Who know the technical details of the measures you will be considering (i.e., they know how to make the mitigation measures work).
- Who will be responsible for implementing some of the plan's recommendations?

Have you access to a Multi-sectoral committee?

In some countries, multi-sectoral committees or sub committees for disaster risk reduction are in operation and hold regular meetings, but often only at the national level. If you are planning for the province, or for a particular sector, do such committees exist?

Have you got a dynamic and committed Leader?

You may be a professional planner, water resource manager, local government official or chair of the multi-stakeholder planning committee, selected to lead the planning process.

Whatever your background, be sure to check on the policy requirements for planning and the jurisdiction to implement what you plan for.

Are there arrangements for review and revision?

A plan for disaster risk reduction may already be in place. Is it up to date? Who prepared it? Was it prepared in the context of a multi-stakeholder forum? Does the plan include practical measures or is it a list of intentions? These are some of the questions that need to be asked. It may well be that the plan needs to be revitalized.

Have you set the appropriate Objectives?

It is important to have clear Objectives of the plan. For example the main objective can be avoidance and therefore actions will be to resettle the people. (The process of planning is important. Make sure it is participatory, and identifies activities for reviewing, educating stakeholders, obtaining consensus, and building commitment and support.)

Do you have adequate legal and mandatory requirements?

It helps if you are officially designated with the authority to develop the plan. A council resolution or a memo from the city manager or mayor is useful, because one of your biggest challenges will be getting other departments to devote some attention to your task.

Have you determined roles of responsibilities for implementation of plan activities?

How do you delegate the authority/responsibility of actions to be undertaken?

Have you avoided bias?

It is important to have an open mind about the range of potential mitigation measures. Different professionals will bring their own preferences to the process. For example, a mitigation plan designed by an engineer often favors structural measures, while a plan prepared by a farming community may be biased towards agricultural needs.

Have you done prioritization of interventions correctly?

How to prioritize the interventions (cost effectiveness, resource constraints and time limitations)?

Challenges



- **Making mitigation a part of regular decision-making process.** Regular decisions relating to planning, staffing, and budgeting can reflect risk reduction priorities effectively when there is a mitigation strategy and a plan for implementation, well-integrated in development policies and plans at all levels and for all sectors.
- **Influencing national governments through the International donor community.** International agencies have begun to incorporate disaster risk reduction as part of their development strategy and plans. The Asian Development Bank has included flood management in their water policy. The World Bank has established a Hazard Management Unit to make sure that disaster risk reduction is an integral part of World Bank's development programs.
- International agencies have also begun to require the development of mitigation plans or the inclusion of mitigation features as part of their plans and funding for disaster reconstruction. The World Bank and Asian Development Bank as part of their recent reconstruction loans are addressing not only emergency response and recovery capacity building but also the development of mitigation plans and measures.
- **Legislation and policy changes.** Many countries in Asia have initiated the incorporation of mitigation strategies in development through legislation and policy change, risk assessment, loans and capacity building programs.

Policies and legislation can encourage planning for disaster risk reduction. China and Japan have legislated mitigation planning at national, provincial and local levels. In the United States, state and local government must have a disaster mitigation plan approved by the Federal Emergency Management Agency in order to receive post-disaster mitigation grants. However, enforcement is generally the weakest part of the system, often due to lack of human and financial resources allocated to this function and political interference.

- **Implementation of capacity building programs.** Building the capacity of national level stakeholder agencies to undertake mitigation, as a part of development process is important. Enhance capacity in policy planning institutions, professionals,

and development agencies of government, NGOs and communities. It is necessary to have innovative solutions to reduce the cost and as a solution to resource constraints.

- **Reducing the burden on relief payment by national governments and diverting the same for development initiatives.** Many countries are beginning to take an interest in using insurance to manage the growing risks. In Asia, this initiative is still in its infancy. China has conducted some pilots in this area.
- **Converting the victims or vulnerable communities in to a resource for undertaking mitigation intervention.** The victims of disasters mostly live in areas prone to hazards. If such communities can undertake interventions to reduce the risk then they can become a resource.
- **Optimization of the production of scientific information and usage by vulnerable communities through facilitation and interface between scientific community, DM practitioners and vulnerable communities.** The scientific community has a tendency to do research purely in academic interest on one hand and on the other hand there is a serious need in innovative cost effective mitigation solutions. Best way to motivate them to undertake research in areas where there is a serious shortfall in innovative solutions capable of reducing the risk and vulnerability is to become an effective interface to create a balance between demand and supply. It includes increase of usage of scientific information effectively for mitigation interventions by vulnerable communities.

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