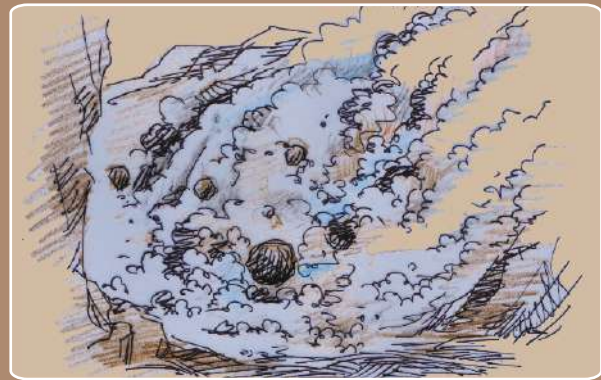
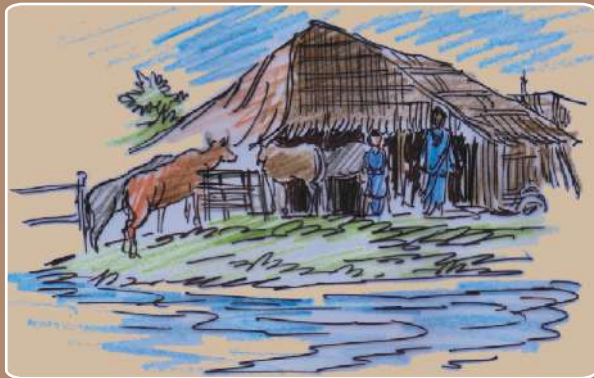


Training Manual

Disaster Risk Management





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Disaster Risk Management

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Introduction

The National Disaster Management Authority (NDMA) in collaboration with UNDP is currently implementing a capacity building programme on Disaster Risk Management for the District and Tehsil Authorities under its National Action Plan 2009-2010. Under the programme, the NDMA has conducted a series of eight courses on “Disaster Risk Management” with two courses in each province. Until now more than 300 officers have been trained and sensitized on the DRM system in Pakistan.

This training manual has been developed for a 5-day training course on Disaster Risk Management. Therefore all those who want to conduct a DRM course, this material could be use a training manual for the course participants.

NDMA is very thankful for the contribution from the following sources from where the training manual has been compiled and adopted;

- Asian Disaster Preparedness Center (ADPC) Bangkok Thailand at www.adpc.net
- United Nation International Strategy for Disaster Reduction (UNISDR) at <http://unisdr.org/>
- United Nation Office for the Coordination of Humanitarian Affairs (UNOCHA) at <http://ochaonline.un.org/>
- PreventionWeb at www.preventionweb.net
- Pakistan Red Crescent Society at www.prcs.org.pk
- United Nations Development Programme at www.undp.org.pk

Objectives

The overall objective of the initiative is to impart training and develop necessary skills to district/tehsil officers with regards to disaster preparedness, response and mitigation for saving lives and properties of people from natural and human-induced disasters.

Purpose

To provide disaster risk management knowledge and skills to district government officers and civil society members who have key disaster risk management responsibilities at the district level. The course will enable professionals to effectively integrate disaster risk management into their development programs and policies. Participants would be encouraged to develop key skills and adopt proactive attitudes through participation in interactive lectures and reflection on a range of key issues raised during discussions and practical activities.

Target Audience

The training manual is useful for all those officials from the Govt, Semi Govt, UN and Civil Societies Organizations who has key role in the organization dealing with the Disaster Risk Management.

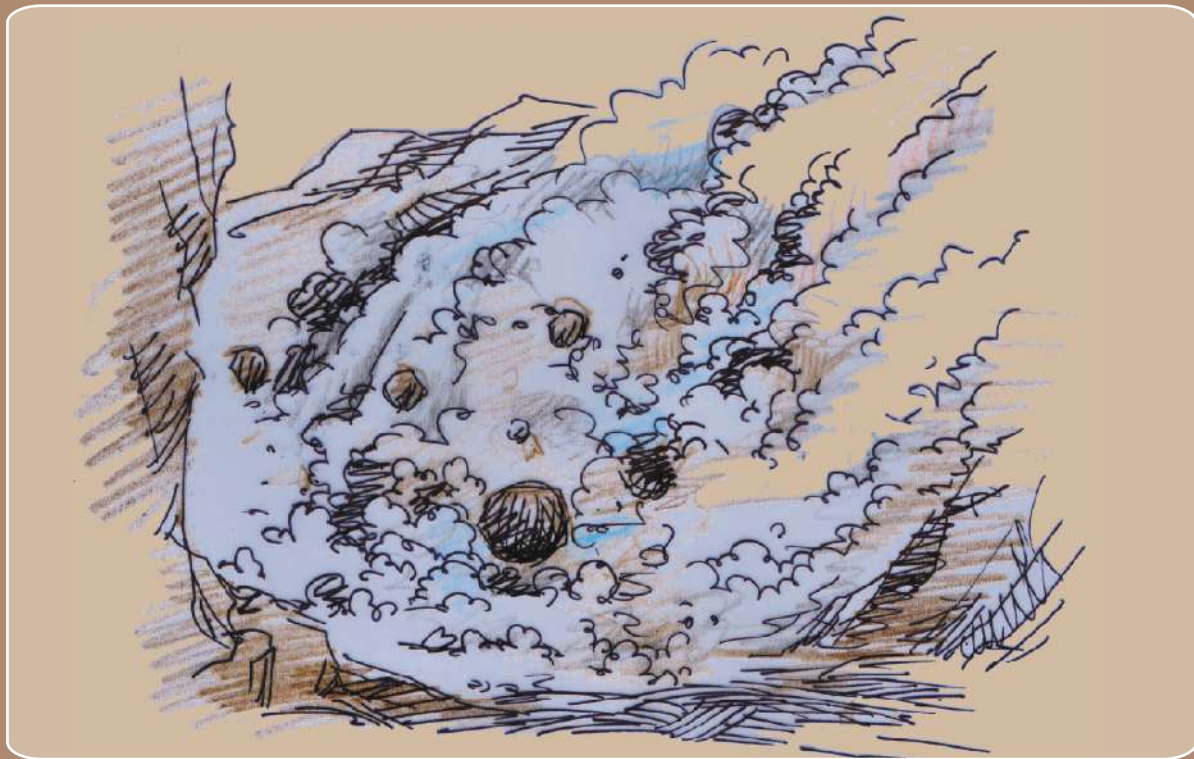
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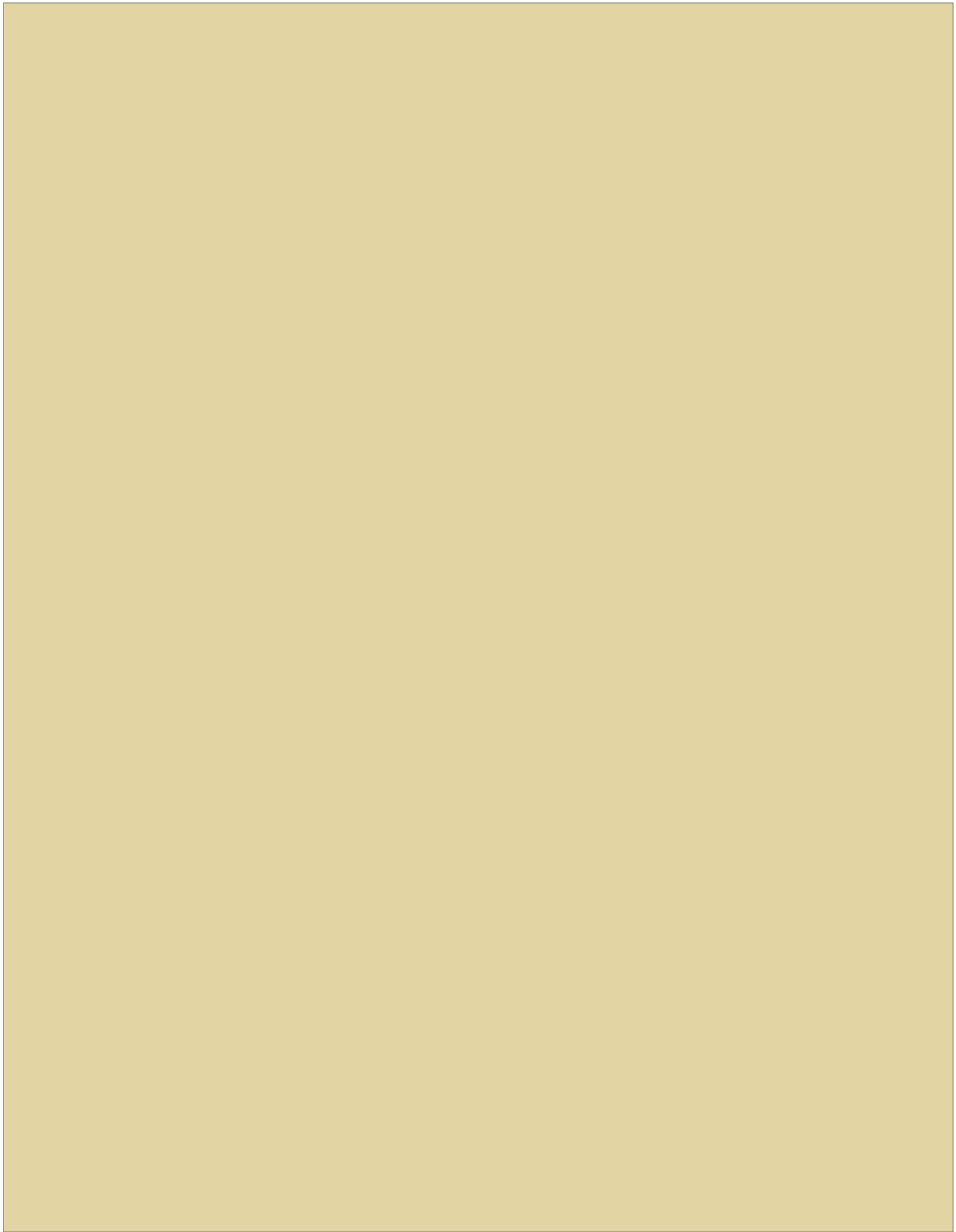
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Module 1:

Introduction to Disaster Risk Management





Session M1.1:

Disaster Risk Management Terms and Concepts

Note: For further detail definitions and concepts clarity, please visit United Nation International Strategy (UNISDR) website <http://www.unisdr.org/eng/terminology/terminology-2009-eng.html>

1- Hazard

- Hazard is an event or occurrence that provokes disaster.
- A hazard is a natural or human-made phenomenon, which may cause physical damage, economic losses, or threaten human life and well being if it occurs in an area of human settlement, agriculture or industrial activity. Note, however, that in engineering, the term is used in a more specific, mathematical sense to mean the probability of the occurrence, within a specified period of time and given area, of a particular, potentially damaging phenomenon of any given severity or intensity.
- A hazard can be defined as a phenomenon that has the potential to cause injury to life, livelihoods and habitats.
- **Natural Hazards:** Natural phenomena which pose a threat to people, structures or economic assets and may cause disaster. High winds, floods, fires, volcanic eruption, landslides, droughts and earthquakes are all natural hazards. In this fast developing society, the distinction between natural and man-made hazards is becoming harder to define. For instance, flooding may be increased through landfill, drainage or groundwater extraction; storm surge hazards may be worsened by the destruction of mangroves.
- **Human-made hazards:** Conditions that may have disastrous consequences for a society. These are associated with industries or energy generation facilities and include explosions, leakage of toxic waste, pollution, dam failures. War or civil strife is included in this category.
- **Hazard Assessment:** The process of estimating, for defined areas, the probabilities of the occurrence of potentially damaging phenomena of given magnitude within a specified period of time. Hazard assessment involves analysis of formal and informal historical records and skilled interpretation of existing topographical, geological, hydrological and land-use maps.
- **Hazard Mapping:** The process of establishing geographically where and to what extent particular phenomena are likely to pose a threat to people, property, infrastructure, and economic activities. Hazard mapping represents the results of hazard assessment on a map, showing the frequency / probability of occurrence of various magnitudes or durations.
- **Hazardous Waste:** Any waste which is flammable, corrosive, reactive or toxic and which may pose substantial or potential hazard to human health and safety or to the environment when improperly managed (reactive refers to the ability to enter into a violent chemical reaction which may involve an explosion or fumes).

- **HazMats:** 'Techno jargon' for hazardous materials, which, if released or misused, could pose a threat to people and the environment. HazMats can be explosives, flammable and burnable substances, poisons and radioactive materials.

2- Vulnerability

All the evidence points to a steep and continuing rise in deaths and injuries from disasters since the 1960s, and there is general consensus amongst researchers and insurers that the number of disasters is increasing. This rise cannot be explained by a parallel rise in the number of earthquakes and cyclones etc. What we are seeing is an increase in the effects of disasters on people or, in other words, an increase in people's vulnerability to disasters.

It is the social, cultural, economic and political environment that makes people vulnerable. This is most apparent in the economic pressures that force many of the poor to live in cheap but dangerous locations such as flood plains and unstable hillsides; but there are many less visible underlying factors - social, political and economic - that affect people's ability to protect themselves against disasters or to recover from them.

Some groups are more vulnerable than others. Vulnerability is not just poverty, but the poor tend to be the most vulnerable. The influence of poverty and the development process on vulnerability to disasters is now well established. Being poor and having little choice, increases vulnerability to disasters. Class, caste, ethnicity, gender, disability and age are other factors affecting people's vulnerability. Those who are already at an economic or social disadvantage because of one or more of these characteristics tend to be more likely to suffer during disasters.

Poor people often get locked in a cycle of vulnerability. Because they are poor, they become vulnerable. Because they are vulnerable, they are at great risk in the face of a natural hazard leading to disaster. Because they suffer greater losses from a disaster, they become even poorer, more vulnerable, and are at an even greater risk. Vulnerability here is:

- Vulnerability is the susceptibility to harm of those at risk.
- Vulnerability is the coping capacity of those at risk.
- Vulnerability is the degree of susceptibility and resilience of the community and environment to hazards.
- Vulnerability depends on the characteristics of a person or group in terms of capacity to anticipate, cope with, resist and recover from the impact of hazard
- The extent to which an individual, community, sub-group, structure, service, or geographic area is likely to be damaged or disrupted by the impact of a particular hazard.
- Conditions of vulnerability are a combination of factors that include poor living conditions, lack of power, exposure to risk, and the lack of capacity to cope with shocks and adverse situations.

- **Classification of Vulnerabilities:** Vulnerabilities can be classified as following:
- ***Physical Vulnerabilities*** are the hazard-prone locations of settlement, insecure and risky sources of livelihood, lack of access to basic production resources (such as land, farm inputs, and capital), lack of knowledge and information, lack of access to basic services.
- ***Social Vulnerabilities*** are reflected in the lack of institutional support structures and leadership, weak family and kinship relations, divisions and conflicts within communities, and the absence of decision-making powers.
- ***Attitudinal Vulnerabilities*** are seen in dependency, resistance towards change, and other negative beliefs. People who have low confidence in their ability to affect change or who feel defeated by events, are harder hit by disasters than those who have sense of their ability to bring the changes they desire.
- ***Economic Vulnerabilities*** pertain to how people make their living and from where they get their livelihood. Determining which type of livelihood is easily affected by disasters (e.g. fishing, tricycle driving, etc.) is a key issue to be considered in determining the magnitude of economic vulnerability.
- **Vulnerability Analysis:** The process of estimating the vulnerability to potential disaster hazards of specified elements at risk. For engineering purposes, vulnerability analysis involves the analysis of theoretical and empirical data concerning the effects of particular phenomena on particular types of structures. For more general socio-economic purposes, it involves consideration of all significant elements in society, including physical, social and economic considerations (both short and long term), and the extent to which essential services, traditional and local coping mechanisms are able to continue functioning.

3- Capacity

All natural crisis events such as floods or earthquakes do not become disasters. Sometimes, they cause no major damage to life or property because they occur where no one lives or because people have taken measures to prevent or reduce their damaging effects. Even when these events do cause damage, not everyone in a disaster area suffers equally. Why is it some people suffer more from disasters than other people? The answer is that some people have fewer capacities and are more vulnerable than others.

Capacity was initially included in disaster management initially as a guide for both international and local agencies who work with vulnerable communities to link disasters to development even in emergency situations disaster survivors have capacities. They are not helpless victims but have coping mechanisms on which to build on for emergency response and recovery. As the developmental and risk reduction paradigms in disaster management emerged, for many vulnerable groups, the viable track to reduce vulnerabilities has been by increasing their social / organizational capacities.

- Capacity is a community's actual or potential ability to withstand disasters through the presence of material and human resources that aid in the prevention and effective response to disasters. This

includes the resources and skills people possess, can develop, mobilize or have access to which allow them to have more control over shaping their future. It is the ability of the community to deal with hazards effectively.

- **Classification of Capacities:** Capacities can be classified as following;
- **Physical Capacities:** Even people whose houses have been destroyed by a typhoon or crops have been destroyed by a flood can salvage things from their homes and farms. Sometimes they have food in storage or crops that can be recovered from the fields or farm implements for planting again. Some family members from the fields or farm implements for planting again. Some family members have skills which enable them to find employment if they migrate, either temporarily or permanently.
- **Social Capacities:** In most disasters, people suffer their greatest losses in the physical and material realm. For the wealthy, they have the capacity to recover soon because of their wealth. In fact, they are seldom hit by disasters because they live in safe areas and their houses are built with stronger materials. However, even when everything physical is destroyed, people still have their skills and knowledge; they have family and community organization. They have leaders and systems for making decisions and capacities in the social and organizational realm.
- **Attitudinal Capacities:** People have also positive attitudes and strong motivations such as the will to survive, love and concern for and willingness to help each other. Coping mechanisms or strategies are generally considered capacities for survival.
- **Economic Capacities:** This refers to the ability of the business sector to recover and re-establish the economic community.

4- Disaster

The term 'disaster' is defined in different ways. For example:

- Sudden or great misfortune, calamity (*Concise Oxford Dictionary*).
- A sudden calamitous event producing great material damage, loss and distress (*Webster's Dictionary*).
- An event natural or man-made, sudden or progressive, which impacts with such severity that the affected community has to respond by taking exceptional measures (*Disaster Management, A Disaster Manager's Handbook, Asian Development Bank, Manila*).
- An event associated with the impact of a natural hazard, which leads to increased mortality, illness and/or injury, and destroys or disrupts livelihoods, affecting the people or an area such that they perceive it as

being exceptional and requiring external assistance for recovery (*Cannon 1994*).

- An event, natural or man-made, sudden or progressive, which impacts with such severity that the affected community has to respond by taking exceptional measures (*Carter 1991*).
- Calamity beyond the coping capacity of the effected population, triggered by natural or technological hazards or by human action (*D&E Reference Center 1998*).
- A disaster is a normatively defined occasion in a community when extraordinary efforts are taken to protect and benefit some social resource whose existence is perceived as threatened (*Dynes 1998*).
- A disaster is an event concentrated in time and space, in which a society or one of its subdivisions undergoes physical harm and social disruption, such that all or some essential functions of the society or subdivision are impaired (*Kreps 1995*).
- Disasters are the interface between an extreme physical event and a vulnerable population (*Okeefe et al 1976*).
- A Condition or situation of significant destruction, disruption and/or distress to a community (*Salter 1997-98*).
- A disaster occurs when a disruption reaches such proportions that there are injuries, deaths, or property damage, and when a disruption affects many or all of the community's essential functions, such as water supply, electrical power, roads, and hospitals. Also, people affected by a disaster may need assistance to alleviate their suffering (*Simeon Institute*).

5- Disaster Risk

- The probability of meeting danger or suffering harm and loss.
- A measure of the probability of damage to life, property, and/or the environment, which could occur if a hazard manifests itself including the anticipated severity of consequences to people.
- Risk = Likelihood x Consequence (*Ansell and Wharton 1992*).
- Risk is nothing more than the consequences of hazard (*Bezek 2002*).
- The possibility of suffering harm from a hazard (*Cohrssen and Covello 1989*)
- Risk is the probability of an event occurring, or the likelihood of a hazard happening (*Presidential/Congressional Commission on Risk Assessment and Risk Management 1997*).

- Risk refers to the probability that death, injury, illness, property damage, and other undesirable consequences will stem from a hazard (*Lerbinger 1997*).
- A function of two major factors: (a) the probability that an event, or series of events of various magnitudes, will occur, and (b) the consequences of the event(s) (*Petak and Alkinson 1982*).
- Expected losses (of lives, persons injured, property damaged and economic activity disrupted) due to a particular hazard for a given area and reference period. Based on mathematical calculations, risk is the product of hazard and vulnerability (*U.N. 1992*).
- The probability of harmful consequences, or expected loss (of lives, people injured, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human induced hazards and vulnerable/capable conditions. Conventionally risk is expressed by the equation $\text{Risk} = \text{Hazards} \times \text{Vulnerability/Capacity}$ (*U.N. ISDR 2002, 24*).

6- Elements at Risk

- Following are described as 'elements at risk'
 - Peoples' lives and health
 - Household and community structure
 - Facilities and services such as houses, bridges, schools, roads, hospitals, etc.
 - Livelihood and economic activities, which include jobs, equipment, crops, livestock, etc.
 - Natural environment

7- Disaster Risk Assessment

- A participatory process of determining the nature, scope and magnitude of negative effects of hazards to the community and its households within an anticipated time period (*ADPC, CBDRM 11*).
- The First Step of the process identifies hazards in the community. Its output should identify, list down and describe the nature of hazards in terms of its recurrence, seasonality, location, possibility of early warning and general knowledge of the people about the hazard.
- The Second Step captures hazards, vulnerability and natural resources and facilities of the community in community and / or digitized maps.
- The Third Step identifies and assesses the vulnerabilities and capacities of the community in general but makes sure that there is gender desegregation of data; special needs groups like children and disabled are given utmost considerations as well.

8- Disaster Risk Management

- Disaster Risk Management is about looking beyond hazards alone to considering prevailing conditions of vulnerability. It is the social, cultural, economic, and political setting in a country that makes people vulnerable to unfortunate events. The basis of this understanding is simple: the national charter and chosen form of governance can be as much of a determinant in understanding the risks in a given country, as are the various social, economic and environmental determinants (*U.N. ISDR 2002*).
- A systematic application of management policies, procedures and practices to identify, analyzes, assess, treat, monitor and evaluate risks. This involves decision-making based on the examination of those risks, which includes hazard, vulnerability, and capacity of people and institutions. (*ADPC, DMC-30, 2003*)

9- Disaster Risk Reduction

- The systematic development and application of policies, strategies and practices to minimize vulnerabilities and disaster risks throughout a society, avoid (prevention) or to limit (mitigation and preparedness) adverse impact of hazards, within the broad context of sustainable development (*U.N. ISDR 2002*).

10- Mitigation

- Mitigation is the social attempt to reduce the occurrence of a disaster, to reduce the vulnerability of certain populations, and to more equitably distribute the costs within the society (*Dynes 1993, 179*).
- Those activities designed to alleviate the effects of a major disaster or emergency or long-term activities to minimize the potentially adverse effects of future disaster in affected areas (*FEMA 1990*).
- Sustained action taken to reduce or eliminate long-term risk to people and property from hazards and their effects. Mitigation distinguishes actions that have a long-term impact from those that are more closely associated with preparedness for immediate response to, and short-term recovery from a specific event (*FEMA 1997, Multi Hazard*).
- In its simplest sense, mitigation is risk management. The term describes actions that can be taken at the individual, local, State and Federal levels to reduce the overall risk from natural disasters.
- Action to reduce the effects of a disaster on a population (*Nimpuno, 1998*).
- Mitigation is seen as prevention stopping a negative event before it happens. (*Peterson and Perry 1999, 242*).
- Measures taken in advance of a disaster aimed at decreasing or eliminating its impact n society and on environment (*U.N. 1992, 4*).

- Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards (*U.N. ISDR 2002, 25*)

11- Preparedness

- Those activities, programs, and systems that exist prior to an emergency that are used to support and enhance response to an emergency or disaster (*FEMA 1992*).
- Preparedness represents actions that are undertaken to reduce the negative consequences of events where there is insufficient human control to institute mitigation measures (*Peterson and Perry 1999, 242*).
- Activities designed to minimize loss of life and damage, to organize the temporary removal of people and property from a threatened location and facilitate timely and effective rescue, relief and rehabilitation.
- Activities and measures taken in advance to ensure effective response to the impact of disasters, including the issuance of timely and effective early warnings and the temporary removal of people and property from a threatened location (*U.N. ISDR 2002, 25*)
- Measures to ensure the readiness and ability of a society to forecast and take precautionary measures in advance of an imminent threat, and to respond to and cope with the effects of a disaster by organizing and facilitating timely and effective rescue, relief and appropriate post-disaster assistance.

Session M.1.2:

National Disaster Risk Situation

The October 2005 earthquake highlighted the risk exposure and vulnerability of Pakistan. The decision makers, politicians, media, development workers, international donors and the general populace have become aware for the first time of the major catastrophic risks facing Pakistan. Pakistan's exposure to natural hazards and disasters could be ranked between moderate to severe. A range of natural hazards including earthquakes, droughts, floods, landslides, avalanches, cyclones/storms, tsunami, glacial lake outbursts, and river erosion threaten Pakistan. In addition, a variety of human induced hazards also threaten the economy and environment of the country. They include industrial, nuclear and transport accidents, oil spills, urban fires and civil conflicts. The highest priority hazards from the perspective of disaster risk reduction include earthquakes, droughts, flooding and transport accidents that can cause widespread damage and losses when they occur. The following is an overview of the key hazards that threaten Pakistan.

1. Earthquakes

Seismologists like Dr. Roger Bilham and his associates believe that one or more great earthquakes may be overdue in a large fraction of the Himalaya, threatening millions of people in the region. They also don't rule out the chances of occurrence of ruptures with magnitudes in the range 7.5 to 8 Mw. in the Balochistan area¹.

The Indo-Australian plate upon which Pakistan, India and Nepal lie, is continuously moving northward, colliding with and sub-ducting under the Eurasian plate, thus forming the Himalayan mountains, and triggering earthquakes in the process. Within the Suleiman, Hindu Kush and Karakoram mountain ranges, the Northern areas and Chitral district in KP, Kashmir including Muzaffarabad, Quetta, Chaman, Sibi, Zhob, Khuzdar, Dalbandin, and the Makran coast (including Gawadar and Pasni) in Balochistan are located within high and very high hazard risk areas. The cities of Islamabad, Karachi and Peshawar are located on the edges of these high hazard areas.

Fig 1.1: Balakot City devastaion during October 2005 earthquake



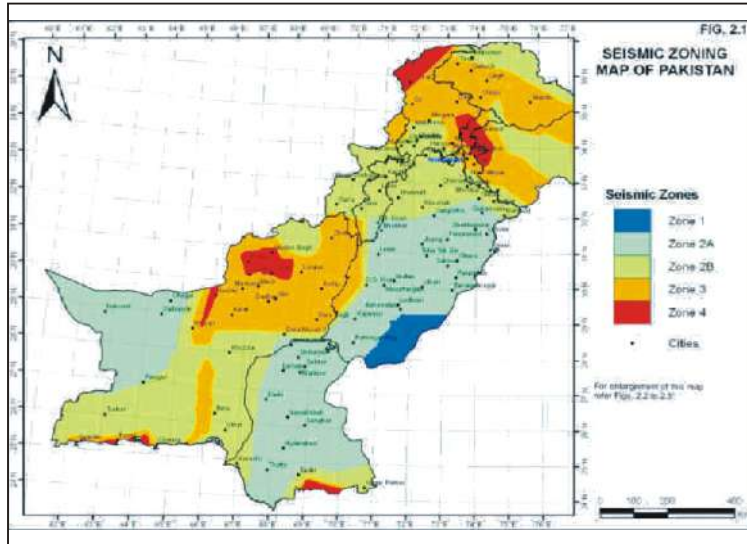
Source: NDMA Islamabad 2008

The areas comprising Pakistan have suffered four major earthquakes in the 20th century including the great Quetta earthquake of 1935, the 1945 earthquake off the coast of Makran, the 1976 earthquake in Northern areas, and the October 2005 Kashmir earthquake. In between these major events, the Northern areas and Kashmir have experienced many small quakes with localized impacts..

The 7.6 Richter scale Kashmir earthquake of October 2005 occurred in a region where a major plate-boundary earthquake was considered long over due. Although the earthquake resulted in widespread

devastation, the scientists believe that it may not have released more than one tenth of the cumulative elastic energy that has developed since the previous great earthquake in the region in 1555 or earlier¹. The seismologists are also concerned about the absence of earthquakes in Balochistan in the recent history, which may mean the occurrence of major seismic activities in future.

Fig 1.2: Seismic zoning map of Pakistan



Source: Geological Survey of Pakistan, 2007

Fig 1.3: Margala Tower Islamabad collapsed during October 2005 earthquake



The 1945 earthquake and Tsunami occurred on 28th November at 05:26 PST (PST), measured 7.8 on the Richter scale. It was centred 87.1 km southsouthwest (SSW) of Churi in Balochistan, or 97.6 km SSW of Pasni. The quake triggered a huge tsunami that caused great damage to the entire Makran coastal region. The tsunami reached a height of 40 feet in some Makran fishing ports and killed more than 4,000 people. This was the last major tsunamigenerating earthquake in the Arabian Sea. It was strong in Karachi and lasted 30 seconds. The clock on the building of the Karachi Municipal Corporation stopped. People were reported to have been thrown out of their beds in the city. The quake was also characterised by the eruption of several mud volcanoes, a few miles inland from the Makran Coast. The 1945 earthquake led to the formation of four small islands off the Makran Coast. A large volume of gas that erupted from one of these islands sent flames leaping hundreds of metres into the sky. The most significant aspect of the earthquake was the tsunami it generated. The tsunami caused great damage to the entire Makran coastal region. The fishing village of Khudji, some 48 km west of Karachi, was obliterated. All the inhabitants and their huts were washed away. At Dabo Creek, 12 fishermen were swept into the sea. There was similar loss of life along other sections of the Makran Coast, The towns of Pasni and Ormara were badly affected. Both were reportedly underwater after the tsunami. Pasni's postal and telegraph offices, government buildings and rest houses were destroyed. Many people were washed away. The telegraphic communications to these two communities were also cut.

Source:

<http://www.drgeorgepc.com/Tsunami1945Pakistan.html>

1. [http://cires.colorado.edu/~bilham/Kashmir 2005.htm](http://cires.colorado.edu/~bilham/Kashmir%2005.htm)- Dr. Roger Bilham of the Cooperative Institute for Research in Environmental Sciences

2. Droughts

The incidence of drought in Pakistan is becoming increasingly common with substantial consequences for food security, livestock production, environment and natural resources. Low rainfall and extreme variations in temperature characterize the climate in Pakistan. About 60 percent of the total land area in the country is classified as arid, which receives less than 200 mm annual rainfall. The main arid rangelands include Cholistan, Dera Ghazi Khan, D.I. Khan, Kohistan, Tharparkar and Western Balochistan. The average annual precipitation in Balochistan and Sindh provinces is about 160mm as compared with 400 mm in Punjab province and about 630mm in KP province. Within Balochistan, the average precipitation varies from less than 50 mm in the southwest to about 400 mm in the northeast. Rainfall variability during different seasons is also considerably high. The climate of the country in the lower southern half is arid and hyper-arid. Some regions of the country in each season remain drastically dry and are always vulnerable to drought. Even a

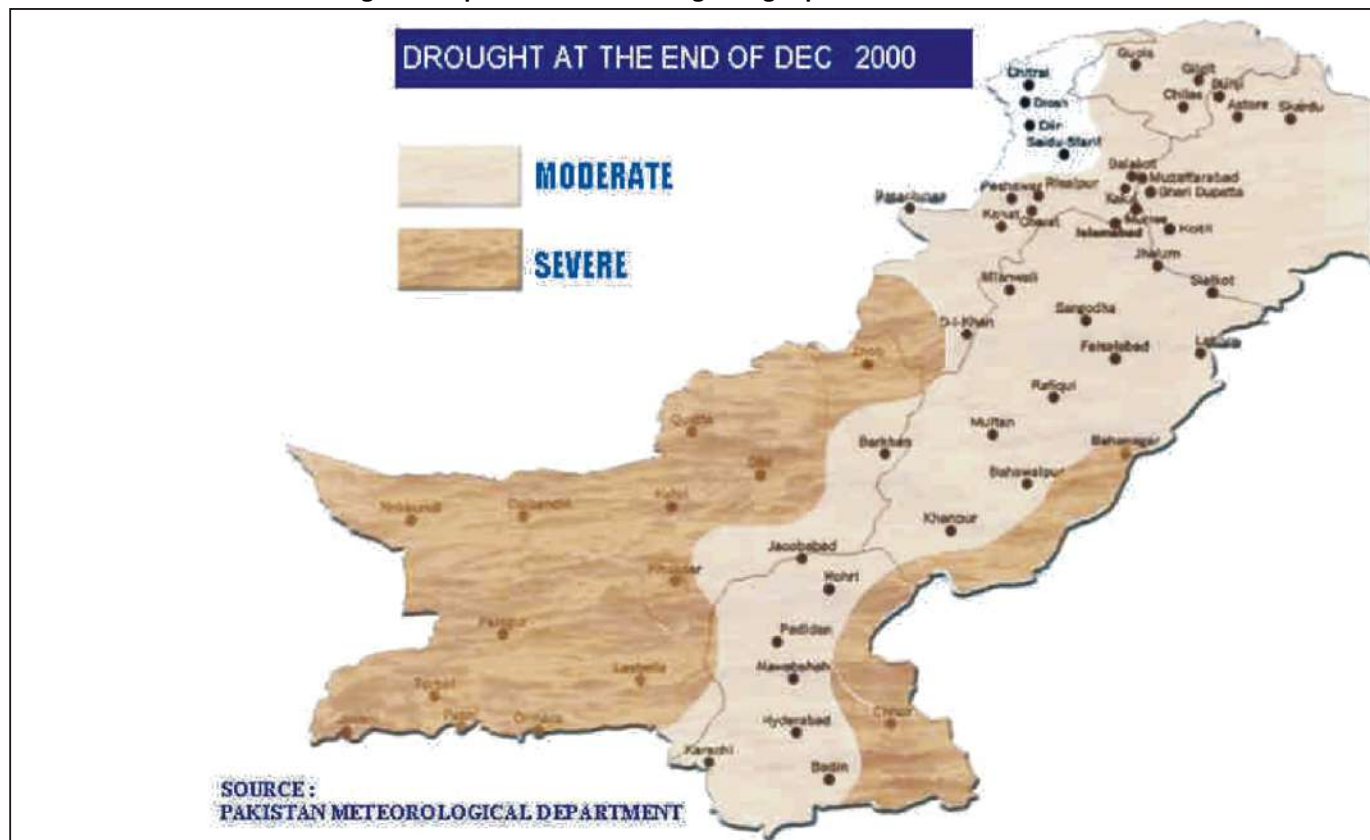
Impact of Recent Drought in Pakistan

The persistent drought occurred in Pakistan during 1997-2001 and severity was much higher in Balochistan and Sindh.

- This drought caused a loss of Pak. Rs. 71.50 billion in agricultural and livestock sector in the year 1999-00 in Pakistan.
- About 2.21 million people and 23.51 million livestock population affected due to severe drought conditions only during 1999-2000.
- Sindh has to face Pak. Rs. 33 billion losses due to drought and water shortage.
- The loss of livestock to drought was about 40% in Balochistan and 60 % in Sindh.

Source: <http://un.org.pk/drought/rcreport13.htm>

Fig 1.4: Map of Pakistan showing drought prone areas in Pakistan



small negative deviation from the low mean rainfall creates additional water scarcity in southern provinces of Balochistan and Sindh and makes them more vulnerable to droughts. In this way, droughts have become a typical feature in Pakistan. These areas experience two-three drought years in every decade.

All provinces of Pakistan have a history of facing major droughts in the past. In recent years, droughts have brought extensive damages to Balochistan, Sindh and Southern Punjab. Severe drought episodes from 1997-2002 affected livelihoods, resulted in human deaths, forced tens of thousands of people to migrate, and killed large numbers of cattle. This drought led to 120 deaths and affected 2.2 million people, while 2.5 million livestock died and another 7.2 million livestock were affected². Twenty-three (23) out of the 26 districts in Balochistan and about 6 districts in Sindh were severely affected. The 2001 drought was termed the worst in the history of the country, which reduced the economic growth rate to 2.6 percent as compared to an average growth rate of over 6 per cent. Furthermore the drought reduced the country's ability to produce hydro-electricity.

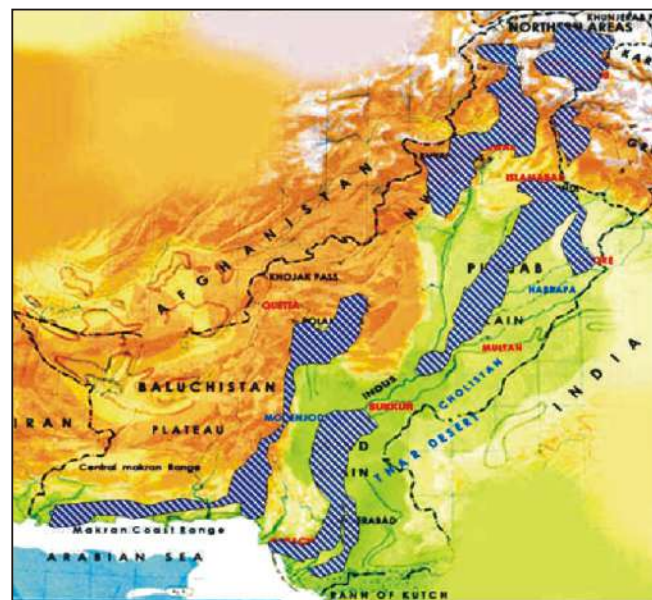
In general, per capita water availability is declining in Pakistan over time due to the combined impact of rising population, falling water flows and erosion in the storage capacity. The country's per capita water availability of 1136.5 cubic meters is only marginally above the threshold level of water scarcity i.e. 1000 cubic meters. Experts predict that with prevailing consumption rates and a population growth of 4 million people per year, one out of three people in Pakistan will face critical shortage of water, "threatening their very survival". The Government has started the National Water Resources Development Programme (NWRDP) 2000-2025. The program has formulated a strategy for water resources development and identified possible sites for dam construction with a total storage capacity of 35.66 MAF (Million Acre Feet).

3. Floods

Fifty six (56 percent) percent of the Indus river basin, one of the largest river basins in Asia, lies in Pakistan and covers approximately 70 percent of the country's area (IUCN, 2005). The largest river in the basin is the Indus River with Chenab, Jhelum, Kabul, Ravi and Sutlej rivers as its major tributaries.

Generally major floods in the Indus basin occur in late summer (July to September) when the South Asian region is subjected to heavy monsoonal rains. In the upper to mid reaches of the Basin, it is generally the tributaries like Jhelum and Chenab rivers, which are the cause of flooding rather than the Indus River itself. The monsoon low depression that causes intense rain develops either in the Arabian Sea or the Bay of Bengal. Major flooding are generally associated with the depression from the bay of Bengal moving across India in West/North-Westerly direction and then turning north at the border with Pakistan.

Fig 1.5: Flash flood distribution in Pakistan



Source: NDMA Islamabad 2010

² Strengthening National Capacities for Multi-Hazard Early Warning and Response System, Pakistan Meteorological Department, May 2006.

The mountain ranges in the extreme north of Pakistan provide perennial source of inflow into the rivers. River floods particularly hit Punjab and Sindh while hill torrents tend to affect the hilly areas of KP, Balochistan and Northern Federally Administrated Areas. Districts of Charsadda, Mardan, Nowshera and Peshawar in KP are exposed to flood risks from the flooding in River Kabul.

Since many rivers are snow-fed, they are also likely to cause flooding due to heat wave in the early summer, combined with early monsoon. Floods in Pakistan can also occur due to the dam bursts. For example in February 2005, the floods hit Pasni in Balochistan due to the Shadi Kot dam burst, resulting from a week of torrential rains.

Economic damages resulting from annual flooding are a major burden on the country. Floods threaten the country's vital agricultural and communication infrastructure and have caused damages and losses worth Rs. 225 billion (USD \$ 4 billion) recorded for the ten largest floods since the country's independence in 1947.

Table 1.1: Major Floods of Indus River Basin in Pakistan

Year	Lives Lost	Monetary losses (Billion rupees)	Villages Affected	Area Flooded (Miles ²)
1950	2,910	9.08	10,000	7,000
1955	679	7.04	6,945	8,000
1956	160	5.92	11,609	29,065
1973	474	5.52	9,719	16,200
1975	126	12.72	8,628	13,645
1976	425	64.84	9,150	32,000
1978	393	41.44	9,199	11,952
1988	508	15.96	1,000	4,400
1992	1,008	56.00	13,208	15,140
1995	591	7.00	6,852	6,518
1998	47	-	161	-
2001	201	-	-	-
2003	230	-	-	-
2004	85	-	47	-
2005	59	1.05	1,931	-
2006	541	1.25	2,477	-
2007	586	8.9	6,498	-
2008	157	3.9	800	-
2010*	1,980	165.7	-	38,610

Source: FFC, Islamabad

* Based on initial assessment, NDMA Islamabad

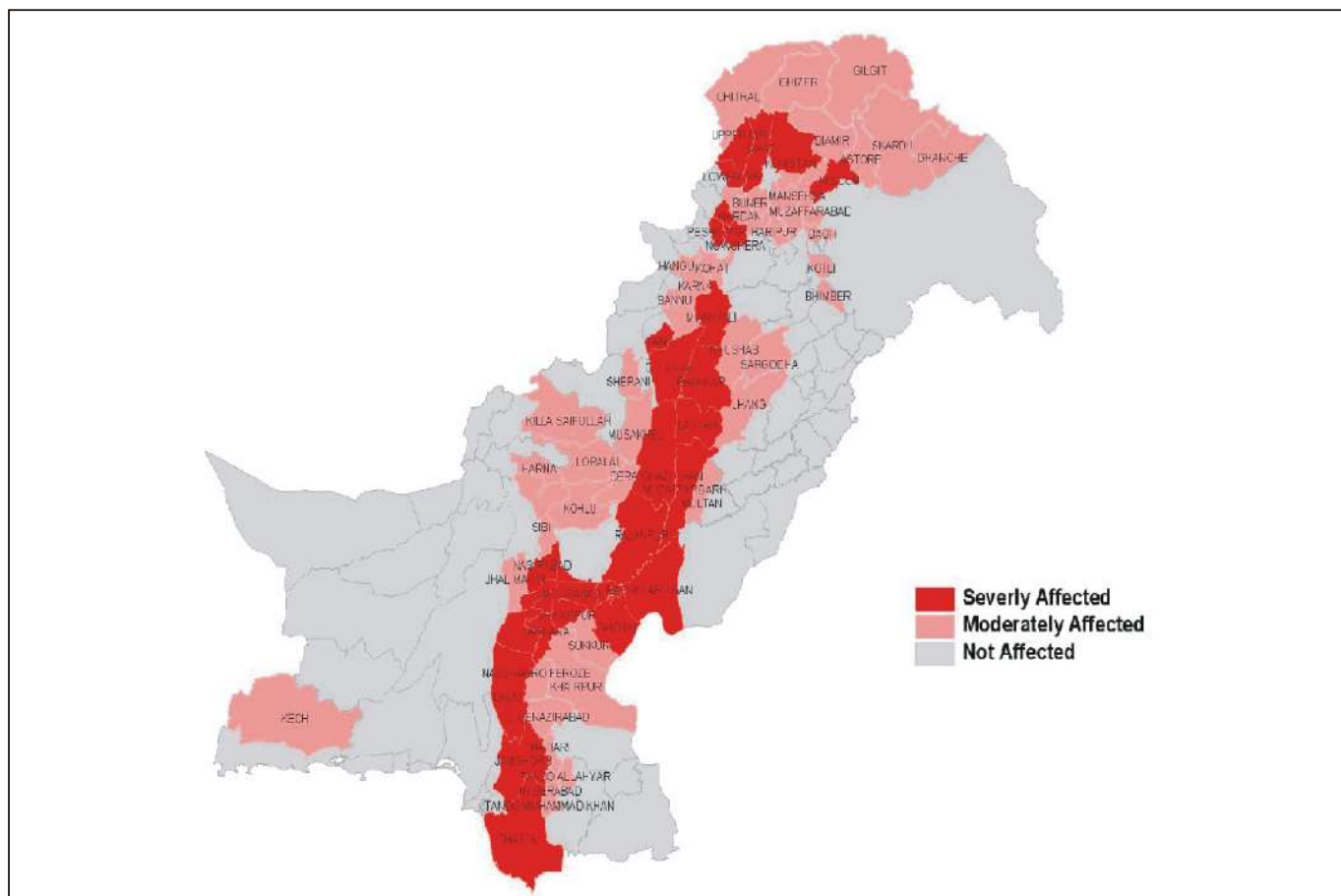
3.1. A case study of the recent 2010 floods

FORMATION

The primary cause of the 2010 floods deemed the worst calamity in Pakistan's history was unprecedented monsoon rain. Extreme rainfall helped precipitate flash flooding, resulting in, at one time, one-fifth of Pakistan being under water. The rains exacerbated flood flows in various canals and nullahs within Khyber-Pukhtunkhwa, southern Punjab, Sindh, Balochistan, Gilgit-Baltistan and Azad Jammu and Kashmir.

2010's first monsoon depression formed on the 24th of July over India, and crossed into Pakistan around on 27th. Over the next few days, the rains increased in force, with their density culminating on the 29th and 30th of July. A second monsoon depression arrived in Pakistan on August 3rd, bringing with it further heavy rainfall⁴.

Fig 1.6: Districts affected by the 2010 floods



Source: NDMA Islamabad, 2010

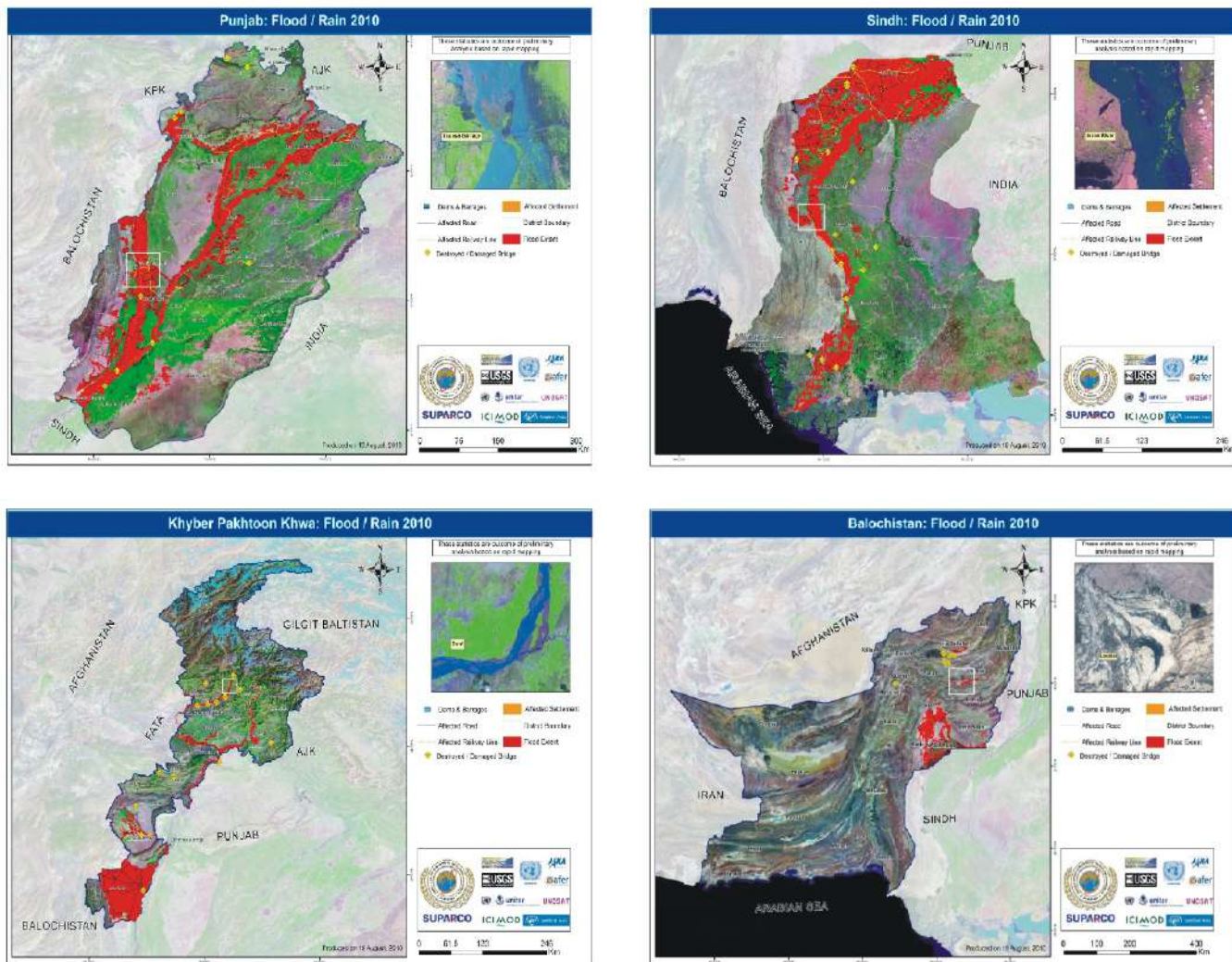
4. Wunderground Blog -

<http://www.wunderground.com/blog/JeffMasters/comment.html?entrynum=1572>

OCCURRENCE

As the monsoon season began, there was record-breaking rain all over KP. Over 7.88 inches of rain fell over KP and Punjab during 24-hour period of time. Additionally, Peshawar saw a record-breaking 10.7 inches of rain within 24-hour period on a separate occasion. By 30th July, the UNOCHA reported that nearly a million people had been directly affected by the rains along with 36 districts⁵. In early August the heaviest flooding, exacerbated by continuing rains, started to move southward along the Indus, leaving in its wake heavily devastated areas of Western Punjab.

Fig 1.7: Satellite images show the extent of the flooding in all Provinces



Source: Downloaded from UNOCHA website Islamabad, 2010

5. Dawn - <http://www.dawn.com/wps/wcm/connect/dawn-content-library/dawn/news/pakistan/provinces/06-un-starts-relief-works-in-flood-hit-provinces-rs-01>

IMPACT

20 million people (about one eighth of the population of Pakistan) have been directly affected by the floods. One study put the cost of the damage at an estimated \$7.1 billion⁶. Over 100,000 square kilometres of land has been left inundated and unfit for use by the floods. This includes 20,000 square kilometres of cultivated crop land, leading to the UNOCHA to declare around 2.2 million hectares of crops lost⁷. Additionally the UN organization reported that over seven million people affected by the floods were currently without shelter. A tentative estimate puts the monetary cost of the crop loss at \$2.9 billion⁸. Additionally, there is the concern that farmers will be unable to plant seeds for the upcoming season, leading to potential food shortfalls in 2011 as well.

Considerable amounts of livestock too were lost as the floods hit the agricultural heartland of the country. Around 324,982 cattle head were lost⁹. Substantial damage to road and rail networks has also taken place with some of it even being intentional in order to control the flood path. Around 12,516 school facilities were destroyed, alongside 579 medical health facilities¹⁰.

The floods also resulted in a multitude of deaths. A total of 1,980 people died as a direct results of the floods, while 2,946 were left injured.

Fig 1.8: Flood water surge in Muzaffarabad



Source: New Statesman - <http://www.newstatesman.com/blogs/the-staggers/2010/08/western-pakistan-floods>

6. New York Times Report - http://www.nytimes.com/2010/08/27/world/asia/27flood.html?_r=2

7. Dawn - <http://news.dawn.com/wps/wcm/connect/dawn-content-library/dawn/news/business/un-says-2.2-million-hectares-of-crops-lost-in-pakistans-floods-jd-04>

8. Bloomberg - <http://www.bloomberg.com/news/2010-08-12/wheat-stocks-sugar-cane-rice-crops-ruined-by-pakistan-s-worst-flooding.html>

9. Pakistanfloods.pk - <http://www.pakistanfloods.pk/en/damage/summary-of-damages>

10. NDMA's dedicated Pakistan floods site - <http://www.pakistanfloods.pk/>

Table 1.2: Summary of damages caused by the flood 2010*

Summary of Damages	Punjab	Sindh	Khyber Pukhtunkhwa	Balochistan	Azad Kashmir	Gilgit-Baltistan	TOTAL
Deaths	110	406	1,156	54	71	183	1,980
Injured	262	1,235	1,198	104	87	60	2,946
Houses Damaged	497,700	876,194	200,799	75,596	7,106	2,830	1,660,225

Source: Pakistanfloods.pk -

http://www.pakistanfloods.pk/images/stories/flood/situation_report/26-10-2010.pdf

* Based on initial assessment received from NDMA

Additionally, the WHO reports the increasing risk and spread of water borne diseases as the relief efforts struggled to provide clean drinking water to the millions stranded. In Khyber Pakhtunkhwa, acute diarrhea and upper respiratory tract infections were recorded in around 15% of patient visits. Skin diseases were encountered in around 19% of total patient visits¹¹. Moreover, the WHO reported that 99 cases of Cholera amongst the flood affected areas were confirmed. Around 1,500 cases of Dengue-fever have also been confirmed, with 15 people dying from the fever¹².

The floods also threatened various power plants throughout the country. This affected both power production and distribution throughout the affected areas. Three power grids in KP were forced to shutdown as a result on the floods¹³.

Considerable infrastructural damage has also taken place. Around 2,433 miles of highway and 3,508 miles of railway tracks have been damaged, at a cost of \$158 million. The floods also damaged the Karakoram highway, affecting trade between China and Pakistan due to logistical problems.

PREPAREDNESS, RESPONSE AND RELIEF EFFORTS

The Pakistan government's initial response to the floods was to evacuate the lower lying areas in Southern Punjab and Northern Sindh as heavy rains in the north helped the floodwaters race Southwards.

The government initially started evacuating around a half-million people from flood-risk affected areas in the South¹⁴. Near the end of August as a flood surge occurred, the government also ordered an evacuation of Thatta as it was under considerable risk of flooding.

The Pakistan Army was brought in to help with the relief and its helicopters were used to provide aid to areas unreachable by road. Also, the helicopters were used to help evacuate people from areas under risk from flood-waters. The army corp of engineers was also employed to help work on various barrages and levees and to strengthen them up enough to stand the force of the floodwaters.

11. ReliefWeb - <http://www.reliefweb.int/rw/rwb.nsf/db900sid/MDCS-88DFSE?OpenDocument&rc=3&emid=FL-2010-000141-PAK>

12. Dawn - http://news.dawn.com/wps/wcm/connect/dawn-content-library/dawn/news/pakistan/12-Pakistan+confirms+99+cases+of+cholera+who--bi-03?pagedesign=Dawn_PrintlyFriendlyPage

13. Dawn - <http://news.dawn.com/wps/wcm/connect/dawn-content-library/dawn/news/pakistan/12-Pakistan+floods+threaten+power+plants--bi-07>

14. Terra Daily - http://www.terradaily.com/reports/Huge_evacuation_underway_as_Pakistan

Fig 1.9: A helicopter helps in evacuation



Source: Boston.com http://www.boston.com/bigpicture/2010/08/severe_flooding_in_pakistan.html#photo39

* Based on initial assessment received from NDMA

Multiple relief camps were also set up by the government to help provide clean drinking water, shelter and medical aid in the aftermath of the floods.

Table 1.3: Summary of relief efforts*

Summary of relief efforts	Punjab	Sindh	KP	Balochistan	Azad Kashmir	Gilgit-Baltistan	TOTAL
Persons rescued ¹⁵	381,496	929,853	50,953	24,630	169	3,423	1,390,344
Relief camps distribution ¹⁶	327	4,196	825	17	2	25	5,392

Source: www.pakistanfloods.pk NDMA Islamabad 2010

Post-flood policies at rehabilitation have led to a myriad of concentrated efforts at trying to get the unemployed, flood affected populace back into employment. One of these is a unique UNDP cash-for-work initiative (currently in Charsadda and Nowshera) where laborers are paid wages for helping clean up their cities and build back infrastructure¹⁷.

15. Pakistanfloods.pk - http://www.pakistanfloods.pk/images/stories/flood/situation_report/26-10-2010.pdf

16. Pakistanfloods.pk - <http://www.pakistanfloods.pk/en/relief/relief-camps>

17. UNDP - <http://content.undp.org/go/newsroom/2010/october/flood-affected-families-in-pakistan-earn-wages-as-they-help-rebuild-their-communities.en>

4. Landslides

The regions of Kashmir, Gilgit-Baltistan and parts of the KP province in Pakistan are vulnerable to landslide hazard. Aside from the young geology and the fragile soil type of the mountain ranges, accelerated deforestation is a major cause behind increased incidences of the landslides in the region. In the aftermath of the 2005 earthquake the steep mountains in Kashmir and KP came down tumbling. The landslides isolated already hard to reach villages and cities. In some cases wide sections of the mountain, more than a kilometre in width slid into the valleys below. Small scale isolated landslide hazards happen frequently in the above regions, which cause significant damages and losses at the local level. Recent landsliding activity in Attabad Hunza (4th January 2010) caused heavy damages to life and property (*see below pictures*). As a result of the landslide movement, it blocks the Hunza river flow thus causing heavy threat to down population along the river.

Table 1.4 : Losses occurred due to Attabad landsliding 2010

Dead	13
Injured	07
Missing	06
Houses completely destroyed	54
Partially Damaged	60
Live Stock (Dead / Missing)	300
Population Displaced	1,652
Affected Households	173
School Completely Destroyed	01
Jamatkhana	01
Blockage of KKH	1.3 Kms
Blockage of Hunza River	1.5 Kms

Source: NDMA Islamabad

Fig 1.10: Affected population are crossing the debris



Fig 1.11: Attabad landsliding devastation



Source: www.pamirtimes.net

Fig 1.12: Downstream blockage of river



The following districts are vulnerable to landslides. Bagh, Bhimber, Neelum and Muzaffarabad in Azad Jammu & Kashmir. Astore, Diamer, Gilgit & Ghanche in Gilgit-Baltistan Province and Kaghan, Naran & Chitral in KP Province.

Experts say that the incidences of landslides can increase in future, since due to deforestation, the forest cover is shrinking by 3.1 % and woody biomass by 5 % annually (7000-9000 ha taken away annually).

Fig 1.13: Real time landslide body movement



Source: Inayat Ali Shamshal Hunza at www.pamirtimes.net

Hunza Lake--- a Threat to Tarbela Dam

It is with reference to a write up in the daily news on 25th March 2010 regarding the situation of Hunza lake. In the write up there are certain facts which need to be corrected to put the whole scenario in the right perspective. It was in July 2009 when on request of local authority of Gilgit-Baltistan, NDMA arranged a study of the Attabad area through Geological Survey of Pakistan and in September 2009 NDMA advised the local government to evacuate the village as it was found hazard prone. Accordingly, evacuation was completed and no life loss occurred in Attabad due to landslide. However the neighboring village (Sarat) suffered 19 casualties due to rebound of debris from across the gorge. These facts have already been reported in media.

Secondly, WAPDA has categorically stated that there is no threat to Tarbela project due to Hunza lake so there is no reason to deny the claims of concerned technical authorities. The inflow of sediments is there but it is not a threat to Tarbela given the distance between the Hunza Lake and the Tarbela dam.

Further in order to assess the situation and respond accordingly NDMA consulted all the technical authorities including FWO, WAPDA, NESPAK and some internationally renowned experts and based upon technical advice it was decided to create a spill way for water release from the artificial lake. The work on spillway is underway and it is likely to be completed by third week of April. In the meantime, three international experts: Dr. Richard Hughes, Dr. David Petley and Mr. Alessandro Palmieri, visited the site for conduct of technical evaluation. Moreover, NESPAK was tasked for a comprehensive technical study to evaluate all the aspects of dam break. Reports received from Dr. Richard Hughes, and Dr. David Petley have been sent to all stakeholders for mid-course correction, whereas report of Mr Alessandro Palmieri and NESPAK will be shared with all relevant agencies as soon as these are ready.

To prepare for a worst possible scenario all the precautionary measures have been put in place including monitoring, early warning system for downstream communities and evacuation plans have been finalized and mock evacuation drills for some communities have also been conducted by Gilgit-Baltistan government. NDMA is continuing to provide helicopters support and boats for transportation of people and goods.

The comparison between Tangjiashan lake of China and Hunza Lake of Paksitan is needed to be taken in right context as both the incidents have some similarities but more dissimilarities. And only technical experts can advise on the subject as every situation has its own nature and dynamics. In Hunza incident all the decisions have been made in the light of technical advice from experts who do not favour explosive method.

5. Tsunami

Pakistan also has a history of tsunami disasters. A big tsunami was experienced on 28th November 1945, due to a great earthquake of magnitude 8.3, offshore Makran Coast south of Pasni during the early hours. The tsunami produced sea waves 12-15 meters high that killed at least 4,000 people in Pasni and adjoining areas. The tsunami waves reached as far as Mumbai in India. Karachi, about 450 kms from the epicentre, experienced 6 feet high sea waves which affected the harbour facilities. Fortunately when the sea wave occurred it was not the time of high tide at Karachi coast. The risk of the occurrence of a future tsunami from this source region exists. The fact that cities like Karachi lie close to the potential epicentres for large submarine earthquakes, demands attention for enhancement of local capacities for disaster risk reduction, early warning and response in order to reduce losses to life, property and environment from future earthquake or tsunami events. Tsunamis may reach the coastal region within one hour. Thus, there is a need to put in place a warning system that would ensure that the warning message reaches the coastal inhabitants as soon as possible.

6. Cyclones/storms

Coastal belt of Pakistan (*especially Sindh*) is highly vulnerable to cyclones and associated storm surges. Fifteen cyclones were recorded between 1971 and 2010. Cyclones can cause large scale damage to the coastal areas of Sindh and Balochistan. The cyclone of 1999 in Thatta and Badin districts wiped out 73 settlements, and it killed 168 people and 11,000 cattle. Nearly 0.6 million people were affected. It destroyed 1800 small and big boats and partially damaged 642 boats, causing a loss of Rs. 380 million. The losses to infrastructure were estimated at Rs. 750 million.

The climate change is causing an increase in the frequency and intensity of storms and changes in their tracks. Although the frequency of cyclones is low along the Pakistani coast, yet they cause considerable damage in the area when they occur. The coastal belt is mostly low-lying therefore storm surges extend several kilometres inland and they damage crops and convert the agricultural land into gully lands for long time. Strong winds create havoc by destroying human settlements, electric and communication installations and trees. In the aftermath of cyclones, areas are left water logged where cultivation is not possible for months due to the soil conditions.

Strong winds create havoc by destroying human settlements, electric and communication installations and trees. In the aftermath of cyclones the areas are left water logged where cultivation is not possible for months due to the soil conditions.

6.1. A case study from the PHET 2010 Cyclone in Pakistan

PHET CYCLONE FORMATION

The Joint Typhoon Warning Center (JTWC), on 30th May reported that an area of low pressure had formed about 925 km, to the southwest of Mumbai, India¹. Additionally, this area of low pressure had loose organized convection developing around the Low Level Circulation Centre (LLCC) around the monsoon trough. Further analysis showed that an anti-cyclone located over the Arabian Sea provided favourable circumstances for increasing the intensity of the Cyclone.

¹ JTWC Report - <http://weather.noaa.gov/pub/data/raw/ab/abio10.pgtw..txt>

Early on June 1st, the depression intensified into a full cyclone and was thus named “PHET” by the Indian Meteorological Department (IMD). Later that day the JTWC reported that Phet was now a category 1 tropical cyclone. The next day, the JTWC reported that at its peak, Phet was a category 4 cyclone with winds up to 230 km/h.

Fig 1.14: Phet Cyclone track



Source: Wikipedia - http://en.wikipedia.org/wiki/File:Phet_2010_track.png

LANDFALL

Cyclone Phet first made landfall in the Oman desert, on the 3rd of June, causing landslides and floods in the east of the country.² It made landfall as a very severe cyclonic storm, with winds of over 185 km/h. It lost intensity quickly after moving inwards, but it kept bringing severe levels of rainfall.

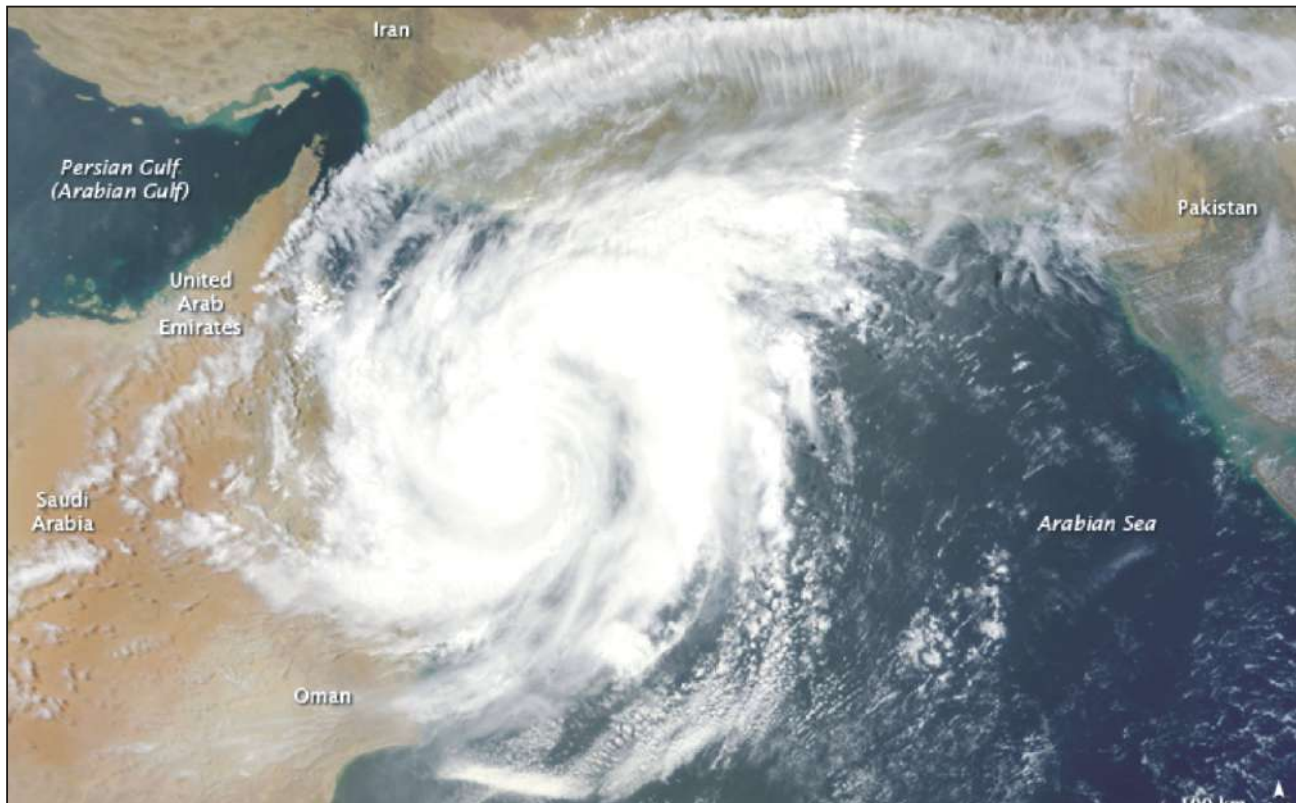
On June 4th, Phet arrived on the Balochistan coast. It initially brought with it 133mm of rainfall. In the Jiwani waters, high tides were observed and this led to egregious levels of rainfall over coastal Balochistan (Gwadar 370mm, Jiwani 208mm, Pasni 139mm). On June 6th, there was considerable rainfall in Karachi (an initial 128mm) and its surrounding districts³. However, the cyclone itself missed Karachi and made landfall near fishing town of Keti Bandar, before hitting Thatta, Badin and Hyderabad Districts in Sindh.

On June 7th, Phet dissipated off of the coast of Pakistan.

² Physorg.com <http://www.physorg.com/news195130893.html>

³ AFP- <http://www.google.com/hostednews/afp/article/ALeqM5jgHzWJF2d3cpyuGcHLAPI7Nq55kg>

Fig 1.15: Satellite image of the Phet Cyclone



Source: NASA - http://www.nasa.gov/images/content/461088main_PHET-MODIS-LARGE.jpg

IMPACT

A day after Phet made landfall in Oman came reports of casualties. Most of the deaths were primarily rain related. Electrocutation was also responsible for a few deaths. The Government of Oman halted oil and gas production in lieu of the rains and floods caused by Phet. By the time Phet left Oman, it had caused a total of 24 deaths.

Phet's landfall in Pakistan brought about considerable disaster as well. Coastal towns of Balochistan such as Gwadar and Pasni were left with electricity blackouts due to rain and flooding. A total of 7,671 houses were damaged in Balochistan, with a population of 37,000 being directly affected by the rain and flooding. Gwadar suffered the brunt of the destruction 6,376 houses were damaged with a total of 10,000 people directly affected.

Phet's devastation in Karachi was even more considerable. The heavy rainfall and 35 mph winds led to electricity blackouts and logistical nightmares, with the city's railway systems in disarray⁴. Most of the deaths were caused by electrocution, and thousands were left homeless in the aftermath of the rains and subsequent floods.

Table 1.5: Phet Cyclone death toll

Name of Country	Deaths
Oman	24
Pakistan	15
India	5
Total	44

⁴ Geo TV - <http://www.geo.tv/6-6-2010/66220.htm>

Table 1.6: Damage caused by Phet Cyclone in Sindh

District	Persons Dead	Villages Affected	Persons Affected	Area Affected in Acres	Persons Injured
Karachi	8	1	506	200	8
Badin	Nil	22	13,228	17,083.06	Nil

Source: PDMA Sindh, 2010

When the storm eventually moved past Karachi and made landfall near Thatta and Badin, the heavy showers consequently disrupted Hyderabad's power supply.

The heavy rainfall also caused casualties in the Indian state of Gujarat. A total of 5 people died with 4 of them dying in incidents of electrocution and lightning. These torrential rains led to many villages in Gujarat and Rajasthan finding themselves submerged in water.

PREPAREDNESS, RESPONSE AND RELIEF EFFORTS

Preparation for Phet primarily included enforced evacuations as well as warnings for fisherman to stay away from the open seas.

In Oman, the government issued emergency evacuation notices to residents of Masirah and Ras Al Hadd. The government also advised residents to keep away from the seas and moved around 10,000 residents to safer areas. Schools were shut down and businesses were made to close early. All the while, rescue teams were on high-alert as a precautionary measure.

In Pakistan, the military and the government's disaster risk management agencies were put on high alert. Additionally, around 60,000 residents from vulnerable coastal areas in Southern Sindh were evacuated. Hospitals all over southern Sindh and in Karachi were also put on high alert.

In Gwadar, according to Inter Services Public Relations (ISPR), military helicopters and planes have taken aid for the people of Gwadar including 15,000 food sacks, 4,000 blankets, 500 tents and 1,000 blankets. The supplies, which also included medicines, were being distributed through helicopters. At the same time however, Karachi found itself debilitated by the torrential downpour, primarily due to poor infrastructure and preparation by the City government.

Multiple relief camps were also set up by the government. Around 168 relief camps were established in Karachi, with 18 in Badin. In the Karachi relief camps, there were a total of 2,135 persons, while in Badin's

Fig 1.16: Phet induced floods in Karachi



Source: AFP, Pakistan

relief camps there were 7,460 persons. In these relief camps the government provided drinking water, meals and medical assistance whenever necessary.

Table 1.7: Relief efforts in Sindh

Details	Karachi	Thatta	Badin
No. of persons evacuated	30,353	53,200	Nil
No. of relief camps established	168	50	18
No. of persons in camps	2,980	29,500	7,460

Source: PDMA Sindh, 2010

Conversely, for many in Balochistan the government response was muted and inefficient at best⁵. No electricity, rising food prices and medicine shortages were just some of the complaints from residents of affected areas in the province. Additionally, water and sanitation proved to a problem as there were reports that the trucks hired by district governments to provide clean drinking water were using water from rainwater ponds⁶.

In India, around 8,000 people were evacuated from Kundla and Tuna in Kutch district, Gujarat. Multiple fire brigade teams were dispatched to other vulnerable towns in preparation for any eventualities.

7. Glacial Lake Outbursts Floods

Another likely scenario that can come into play is the burst of glacial lakes in the upstream of Indus basin due to heat waves, a phenomenon termed as Glacial Lake Outburst Flood (GLOF). A recent study found that, of the 2,420 glacial lakes in the Indus basin, 52 lakes are potentially dangerous and could result in GLOF with serious damages to life and property. The study has also indicated that global warming can increase the potential of GLOF in future.

Although the history of GLOF is not documented in Pakistan, records indicate that GLOF occurred in Ghizer Valley in the Ishkoman region in 1960 and in the Hunza region in 1992-93. The Karakoram Range generally has higher elevation and is seen as being beyond the impact range of climate change, yet it is alarming that five GLOF events occurred in less than one year (2007-2008) in parts of Gojal Tehsil in Hunza River Basin which posed a great risk to the downstream communities. Similarly, the Shingo Basin, Astor areas south of Gilgit and the Jhelum valley are also vulnerable to the GLOF disaster.

8. Avalanches

The Kashmir region and northern areas in Pakistan experience avalanches on a regular seasonal basis. Local people in the hazardous region and the tourists are vulnerable to this hazard.

5. IRIN News - <http://www.irinnews.org/report.aspx?Reportid=89464>

6. The Baloch Hal - <http://thebalochhal.com/2010/06/pdis-phet-cyclone-rapid-assessment-district-gwadar/>

9. Industrial, nuclear and transport accidents

Transport accidents are a common phenomenon in Pakistan. Particularly the train system in Pakistan is notorious for collisions. Hundreds of people have been killed in such accidents. Plane crashes and road accidents are not uncommon events and one shouldn't forget the tragic air blue crash which took 152 precious lives (*see more detail below*).

The growing industrialization particularly within urban settlements in cities like Gujranwala, Faisalabad, Karachi, Lahore, Sialkot and elsewhere can be a source of major industrial disasters, although Pakistan has not experienced any such events in the past. Neighbouring India suffered from Bhopal Gas leakage in 1985, in which 5000 people were killed and enormous health hazards were experienced by citizens of Bhopal. Having installed various nuclear facilities and nuclear power stations, Pakistan is also exposed to the risks of nuclear accidents. The Chernobyl disaster in Russia must serve as a reminder in this regard.

Pakistan now has two ports in Karachi and Gawadar along the coast of Makran. These areas are at risk from marine accidents. In August 2003, in Karachi, the wreckage of Tasman Spirit, an old Greek ship caused colossal environmental losses and health hazards for the businesses, port workers and adjacent communities. About 28,000 tonnes of oil spilled all over the harbour area, which affected marine life in a major way. The residents in the area reported headaches, nausea and respiratory problems in the weeks following the accident. It took months for the authorities to clear the oil affected areas.

all over the harbour area, which affected marine life in a major way. The residents in the area reported headaches, nausea and respiratory problems in the weeks following the accident. It took months for the authorities to clear the oil affected areas.

9.1. A case study of Air Blue Crash 2010

On 28th July, Airblue Flight 202 took off from Karachi for its destination, Islamabad. Conditions in Islamabad were poor, and prior to diverting away Flight 202, the air traffic controllers at Benazir Bhutto Islamabad Airport had already diverted another flight half an hour earlier¹.

Various reports suggest that as the plane flew away from the runway, it lost contact with air traffic controllers. The heavy rainfall and fog added to the low visibility, and it is suggested that this ultimately caused the crash as the pilots did not send any emergency signals².

The plane eventually crashed in the Margalla Hills, close to the Daman-e-Koh viewing point³. Billowing smoke and debris was found as the crash scene, alongside reports of charred bodies and limbs strewn throughout the crash.

As the plane struck the hillside, it eventually slid down into a considerably more isolated area that was inaccessible with rescue vehicle⁴. Initial reports suggested some survivors, but eventually Interior Minister Rehman Malik clarified that there were in fact no survivors⁵.

1. New York Times - <http://www.nytimes.com/2010/07/29/world/asia/29pstan.html>

2. Express Tribune - <http://tribune.com.pk/story/31928/passenger-plane-crashes-in-islamabad/2>

3. Times of India - <http://timesofindia.indiatimes.com/world/pakistan/20-dead-as-plane-crashes-near-Islamabad-45-rescued/articleshow/6226631.cms>

4. Dawn <http://news.dawn.com/wps/wcm/connect/dawn-content-library/dawn/news/pakistan/04-plane-crash-margalla-qs-02>

5. Ibid

6. Ibid

Fig 1.17: Crash site in Islamabad



Source: Dawn⁶

The pilot of the plane had logged over 35 years and nearly 25,000 hours of flight experience, while the co-pilot was ex-PAF, who had logged a year of experience on the Airbus A321. Of the 146 passengers on the flight, 110 were men, 29 were women, 5 were children and 2 were infants. Four foreign nationals also perished. Alongside the 146 passengers were the 6 Pakistani crew members, bringing the total number of fatalities to 152.

Table 1.8: Total deaths caused by the crash

Nationality	Fatalities
Pakistani	148
Somalian	1
American	2
Austrian	1
Total	152

Source: NDMA Islamabad, 2010

RESPONSE, RELIEF AND RECOVERY

The first people to arrive after the disaster were CDA's rescue 1,122 personnel which included fire fighters deployed at the top of the hills to prevent the outbreak of fire and Rangers personnel deployed near the bottom of the hill. Police from nearby areas also made it to the crash site⁷.

Recovery efforts were hampered for a considerable period of time by bad weather, as rain continued to hammer down and made it tougher for rescue workers to manoeuvre the terrain. Helicopters arrived at the

scene as well but were unable to land due to the heavy fog. All hospitals in Islamabad were as a result of the crash declared to be in a state of emergency⁸.

Rescue efforts were also seemingly marred by a lack of coordination and proper training. The CDA chairman acknowledged the fallibility of CDA rescue workers and stated that they were ill-equipped to deal with emergency situations in forests, as their training had been primarily for urban areas.

While the CDA took lead in the on-ground rescue efforts, NDMA provided air support. Initially the helicopters dropped water onto the fire to contain and extinguish it. They then dropped various tools intended for the rescue workers to help them sift through the destruction in search of bodies.

The authorities however claimed that by the end of the first day of rescue work, over 90 percent of the bodies had been recovered despite the appalling weather conditions. The rest of the bodies were apparently under the wreckage and would have to wait till the next day⁹.

10. Urban fires

Fortunately Pakistan has not experienced any major urban fire incidents so far. However, considering the pace of urbanization, coupled with industrialization, the chances of urban fires can't be ignored. CNG gas stations are installed in all urban areas and it is also sold at small shops and stores for household use. In small cities and towns the sale of petroleum products at small shops located within residential areas is also common. These practices combined with mass culture of smoking cigarettes could pose a major fire risk. The fire services in urban centres, except Karachi, are poorly equipped.

11. Civil conflicts

Pakistan is a diverse society, ethnically, linguistically, religiously and culturally. This diversity has some times led towards civil conflicts amongst various social groups. For example, Pakistan has suffered sectarian conflicts during the 1980s and 1990s. These conflicts caused loss of life and damage to property, while creating insecurity for various social groups in the affected areas. Pakistan has also born the brunt of Afghan war in the form of hosting about 6 million refugees for more than two decades. About 2 million Afghan refugees still live in various parts of Pakistan. This mass scale invasion has damaged the social fabric of Pakistan.

7. Dawn - <http://news.dawn.com/wps/wcm/connect/dawn-content-library/dawn/news/pakistan/04-plane-crash-margalla-qs-02>

8. Times of India - <http://timesofindia.indiatimes.com/world/pakistan/20-dead-as-plane-crashes-near-Islamabad-45-rescued/articleshow/6226631.cms>

9. Dawn - <http://news.dawn.com/wps/wcm/connect/dawn-content-library/dawn/news/pakistan/04-plane-crash-margalla-qs-02>

Session M.1.3:**National Disaster Risk Management Framework**

After the promulgation of National Disaster Management Ordinance, 2006 (NDMO), an elaborate system of Disaster Risk Management (DRM) at the national, provincial and district level has been established. The National Disaster Management Authority (NDMA) at the federal level has started acting as a focal point to lead the process by facilitating the work of Provincial Disaster Management Authorities (PDMAs) and the District Disaster Management Authorities (DDMAs). The new system envisages achieving sustainable social, economic and environmental development in Pakistan through reducing risks and vulnerabilities. It has a mission of enhancing institutional capacities for disaster preparedness, response and recovery with a risk reduction perspective in the development planning process at all levels. In line with this vision, the National Disaster Risk Management Framework (NDRMF) has identified the following guiding principles:

- Focus upon most vulnerable social groups; e.g. children, women, elderly, minorities;
- Promote community and local level preparedness culture;
- Follow multi-disciplinary and multi-sectoral approaches;
- Combine scientific knowledge with social knowledge;
- Make development policy, planning and implementation risk-sensitive;
- Develop culturally, economically and environmentally relevant technologies for safer construction in different parts of the country;
- Promote sustainable livelihood practices in areas at high risk from multiple hazards;
- Establish and strengthen partnerships amongst multiple sectors e.g. government, private sector, media, insurance, NGOs, civil society organizations, UN and donors;
- Work with other countries and international community to promote disaster risk reduction;
- Acquire specific capacities / capabilities keeping in view hazard-risk profile of the country; and
- Develop disaster risk management plans from district level upwards in view of specific requirements of the local area.

Priority Areas

The DRM system revolves around the following 9 priority areas, which are being implemented at the national, provincial, district and community level:

1. Institutional and Legal Arrangements

The National Disaster Management Ordinance calls for the establishment of disaster management commissions and authorities at the federal, provincial and district level. The commissions are mandated to take policy decisions whereas the authorities are the implementing and coordinating arms. The national and provincial disaster management commissions and authorities have been established. Similarly, the DDMAs have also been notified. Under this priority area, the institution of technical committees on various aspects and development of legal instruments, guidelines and procedures are planned to be undertaken.

2. National Hazard and Vulnerability Assessment

In order to make informed policies, strategies and programs on disaster risk management, a Vulnerability Atlas of Pakistan will be prepared. This would include hazard maps indicating the location of various hazards with zonation of risk levels (*low, moderate, severe*). The Atlas will also include analysis on vulnerability of settlements, housing stock, important infrastructure and environmental resources. A disaster inventory will also be developed to facilitate analysis on disaster and vulnerability trends.

3. Training, Education and Awareness

Training, Education and Awareness programs would involve multiple sectors such as civil servants, federal and provincial ministries, staff of district, provincial and national Disaster Management authorities, technical agencies, UN staff, NGOs, media, politicians and more importantly communities. Apart from trainings on vulnerability reduction, hazard mitigation and emergency response management, specialized trainings are also being imparted in areas of search & rescue, first aid, fire fighting, evacuation, camp management and relief distribution.

4. Promoting Disaster Risk Management Planning

DRM planning is essential to minimizing adverse effects of hazard(s) through effective disaster risk reduction, preparedness and adequate, timely and coordinated response. It is planned to have a National Disaster Response Plan, which will define roles and responsibilities of federal ministries, departments and other entities in relation to national level disaster response. All the provincial DMAs including AJK and Northern Areas have already developed their respective provincial DRM plans whereas DDMA's are in the process of developing local plans.

5. Community and Local Level Risk Reduction Programming

It is rightly believed that the community level program implementation is the heart of disaster risk reduction strategies because disaster risks are essentially local in term of their impact and so as the response. That is why the community based initiatives for the capacity building of local officials and communities, CBOs, builders, contractors, masons, teachers and doctors etc. have been considered of immense importance in the National Framework. The NDMA has launched the first phase of community level activities in Badin & Thatha (*Sindh*), Quetta & Kech (*Balochistan*), Mansehra (*KP*) and Muzaffarabad (*AJK*).

6. Multi-hazard Early Warning System

The early warning capacities for droughts will be enhanced and the Early Warning System (*EWS*) will be developed for cyclone and tsunami hazards. The role of media will also be enhanced to improve dissemination of warnings. Likewise, communities will be linked with different warning agencies in order to be able to react timely and efficiently.

7. Mainstreaming Disaster Risk Reduction into Development

The purpose of mainstreaming DRR into development is to ensure that the development infrastructure in hazard-prone areas is built to higher standards of resilience against multiple natural and man-made hazards. This will be done by incorporating risk and vulnerability assessment into project planning stage. NDMA will work with the National Planning Commission and the Ministry of Finance in order to integrate disaster risk reduction into the National Development Plan and the National Poverty Alleviation Strategy.

Some pilot projects with selected ministries will be initiated on mainstreaming of risk reduction.

8. Emergency Response System

Apart from the National Emergency Operations Centre (*NEOC*), NDMA will facilitate PDMA's in establishing emergency operations centers at the provincial and district levels. The *NEOC* would serve as a hub for receiving early warnings and issuing necessary instructions to response agencies. It would also lead coordination and management of relief operations in affected areas. Standard Operating Procedures (*SOPs*) will be drafted to define roles of federal, provincial and local agencies for their involvement in emergency response.

9. Capacity Development for Post Disaster Recovery

In order to manage disaster recovery programs effectively, it is very important to put institutional arrangements and system in place. NDMA will develop guidelines for recovery needs assessment and recovery program design and management for multiple sectors. Similarly, orientation workshops for line ministries and other stakeholders on post disaster recovery program design and implementation will be organized.

Session M 1.4:**Disaster Risk Management Structure**

In line with the provisions of NDMO, the Government of Pakistan has approved and notified the following DRM structure at the national, provincial and district levels:

1- National Level**1.1. National Disaster Management Commission (NDMC)**

Headed by the Prime Minister as its Chairperson, the NDMC is the highest policy and decision making body for disaster risk management. Other members include opposition leaders of both the houses; Chief Ministers of four provinces; Governor KP; Prime Minister AJK; Chief Minister of Gilgit-Biltistan; Chairman JCSC or his nominee; federal ministers for Communications, Defence, Finance, Foreign Affairs, Health, Interior, Social Welfare and Special Education; Chairman NDMA; Representative of Civil Society; and any other person appointed or co-opted by the Chairperson. NDMC is mandated to formulate policies and develop guidelines on DRM, approve DRM plans prepared by Ministries or Divisions of the federal government, arrange and oversee funds, and provide support to other countries affected by major disasters.

1.2. National Disaster Management Authority (NDMA)

NDMA has been established to serve as the focal point and coordinating body to facilitate implementation of disaster risk management strategies. Following are the powers and functions of NDMA:

- Act as the implementing, coordinating and monitoring body for DRM;
- Prepare the National DRM Plan to be approved by the National Commission;
- Lay down guidelines for preparing DRM Plans by different Ministries or Departments and the Provincial Authorities;
- Implement, coordinate and monitor the implementation of the National Policy;
- Provide necessary technical assistance to PDMA's for preparing Provincial DRM Plans;
- Coordinate response in the event of any threatening disaster situation or disaster;
- Promote general education and awareness in relation to DRM;
- Perform such other functions as the National Commission may require it to perform.

2- Provincial Level**2.1. Provincial Disaster Management Commission (PDMC)**

The PDMC is chaired by the Chief Minister and other members include opposition leader and a member nominated by him. The CM has the powers to nominate other members of PDMC. Similarly, he may designate one of the members to be the Vice Chairperson. The powers and function of PDMC are as following:

- Lay down the provincial / regional DRM policy;
- Approve the DRM Plan
- Review implementation of the Plan;

- Review the development plans of provincial departments and ensure that risk reduction measures are integrated; and
- Oversee the provision of funds for risk reduction and preparedness measures.

2.2. **Provincial Disaster Management Authority (PDMA)**

The PDMA is headed by a Director General appointed by the Provincial Government. Following are the powers and functions of PDMA:

- Formulate DRM policy and obtain approval of the PDMC;
- Ensure implementation of DRM policies and plans in the Province;
- Coordinate and monitor the implementation of the National Policy, National Plan and Provincial Plan;
- Examine the vulnerability of different parts of the Province to different disasters and specify prevention or mitigation measures;
- Lay down guidelines to be followed by Provincial Departments and District Authorities for preparation of DRM plans;
- Evaluate preparedness and response arrangements of public and private agencies / departments at the provincial level;
- Coordinate response in the event of disaster;
- Give directions to any Provincial department or authority regarding actions to be taken in response to disaster
- Ensure that communication systems are in order and disaster management drills are being carried out regularly.

3- District Level

3.1. **District Disaster Management Authority (DDMC)**

The Disaster Management Ordinance put ample emphasis on establishing DDMA by notifying them in the Official Gazette. DDMA are headed by District Nazims whereas DCOs / DCs, District Police Officers (*DPOs*), EDOs (*Health*), and any other district-level officer appointed by the District Government are its members. Following are the powers and functions of DDMA:

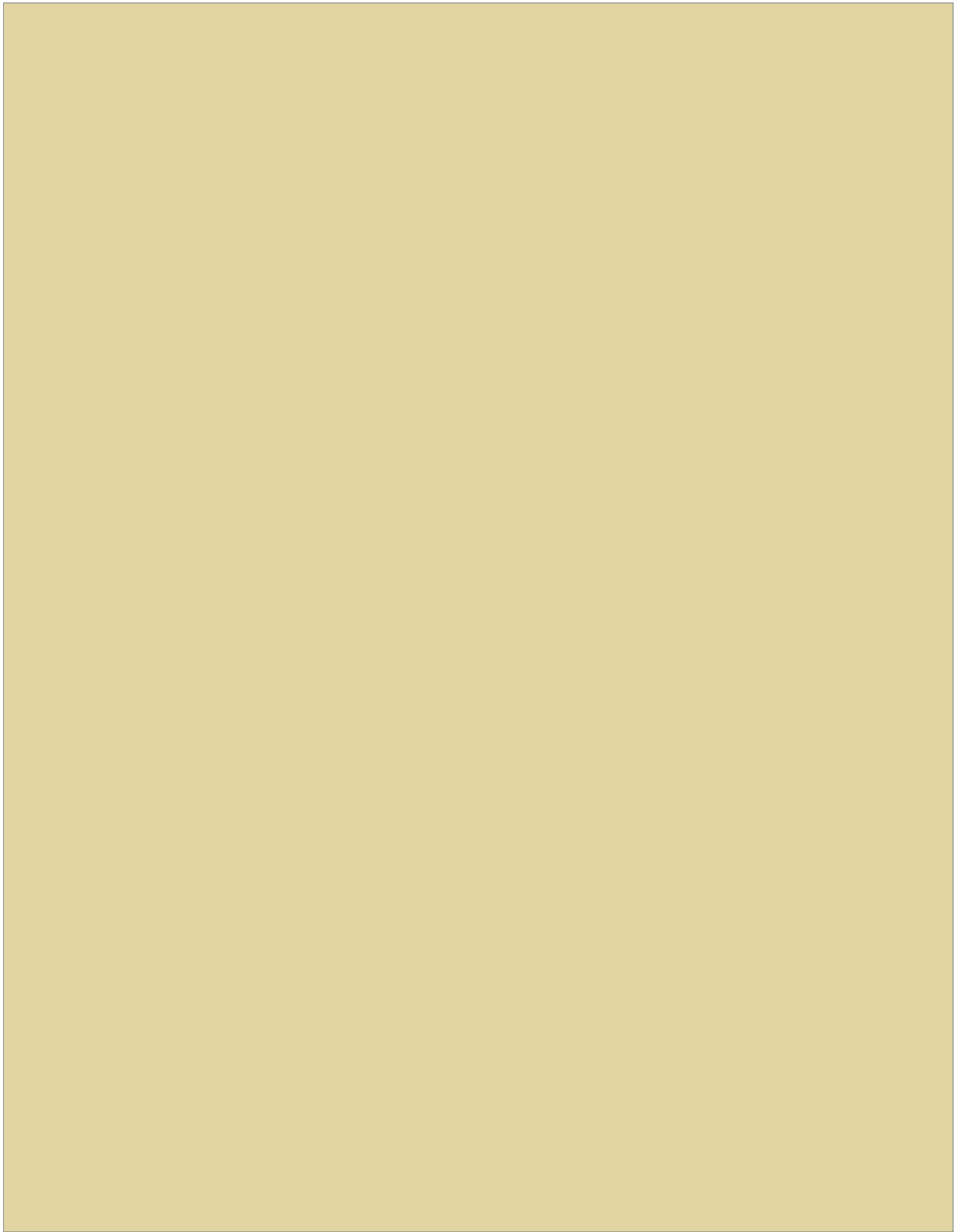
- To plan, coordinate and implement DRM measures in accordance with the guidelines laid down by NDMA and PDMA;
- Prepare District Disaster Risk Management Plan (*DDRMP*) and district Emergency Response plan;
- Ensure that the risk-prone areas are identified and prevention and mitigation measures are undertaken accordingly;
- Ensure that the guidelines for prevention, mitigation, preparedness and response measures as laid down by NDMA and PDMA are followed by all district level departments;
- Lay down guidelines for disaster management plan;
- Monitor the implementation of DRM plans prepared by the district departments;
- Organize and coordinate DRM training programs for district government officials, community members and community-based organizations;

- Set up, maintain, review and upgrade the mechanism for early warnings and dissemination of proper information to public;
- Prepare, review and update district level response plan and guidelines;
- Establish stockpiles of relief and rescue materials;
- Ensure that communication systems are in order and disaster management drills are carried out periodically.

Module 2:

Disaster Risk Assessment





Session M.2.1:

Overview of Disaster Risk Assessment

“Risk is the probability of something happening in the future, which has a negative consequence”.
(R. Bellers, 199).

Risk is commonly used to mean the probability or likelihood of meeting danger or suffering harm and loss. Risk is sometimes taken as synonymous with hazard but risk has an additional implication of the chance of a particular hazard actually occurring. It is also the exposure of something of human value to a hazard and is often regarded as the combination of probability and loss.

Assessment is a participatory process undertaken in phases and involving on-the-spot collection, interpreting and analyzing of information from various sources.

Disaster Risk Assessment at the community level is hazard, Vulnerabilities and Capacities assessment.

Community Risk Assessment is a participatory process of determining the nature, scope and magnitude of negative effects of hazards to the community and its households within an anticipated time period. (ADPC, CBRM 11)

Disaster Risk Assessment involves a participatory analysis and combination of both scientific and empirical data concerning the probabilities of hazards in any particular area, the negative effects expected to result to each element at risk for each particular hazard, and considering the coping mechanisms.

Risk Assessment is a structured analytical procedure to identify hazards and to estimate the probability of their occurrence, and the consequences in the light of the conditions. These estimates are then compared with a standard or criterion in order to decide whether or not action is desirable, to reduce the probabilities or to protect people, property, or environment.

Through disaster risk assessment, we get to know the possible disaster situation and predict the severity of possible future hazards, its damaging effects, the needs and available resources at a certain location.

The assessment process has four steps:

Hazard Assessment: Identify, list down and describe the nature of hazards in terms of its recurrence, reasonability, location, possibility of early warning and general knowledge of the people about the hazard.

Vulnerability Assessment: Identify what elements are at risk and why (refer to unsafe conditions, dynamic pressures and root causes).

Capacity Assessment: What are people's coping strategies; what resources are still available; who has access and control over these resources?

Community's Risk Measurement: understanding peoples' perception of risk

Purpose of Disaster Risk Assessment:

- Risk Assessment provides a systematic process for identifying, estimating, and ranking disaster risks.
- It is a required step for the adoption of adequate and successful community-based disaster risk reduction policies and measures (*IDNDR, Yokohama Strategy*).
- Disaster Risk Assessment is done for the purpose of risk reduction planning to:
 - Identify prioritized risks that need to be reduced;
 - Ensure that the risk reduction is going to be adequate and appropriate;
 - Ensure that risk reduction will be cost effective and sustainable;
 - Balance between preparedness and long-term mitigation measures;
 - Identify if there are other activities that would have a more positive development impact;
 - Identify existing capacities to assist in risk reduction both externally & within communities;
 - Assess if we are succeeding in reducing risk;
- It provides disaster specific baseline data that can be integrated in a situational analysis for development program purposes.
- The information generated through the process can be used for informed estimates in order to draft emergency appeals.

At the end of the disaster risk assessment process, all actors should be able to accomplish the following objectives and outputs:

Table 2.1: Disaster Risk Assessment Design

	Objectives	Outputs
Step 1	Describe hazards in the Community	List and nature of hazards
Step 2	Conduct hazard mapping	Community resource map Digitized map
Step 3	Describe vulnerabilities and capacities of community, of women and men	Capacities Vulnerabilities Analysis (CVA) by the communities
Step 4	Determine Disaster Risk	Comprehensive list of risk faced by the communities
Step 5	Rank Disaster Risk	Prioritize list of risks
Step 6	Decide on acceptable level of Risk	Agreed levels of risk for family and community security
Step 7	Decide whether to prevent, Reduce, transfer, or live with the Disaster risk(s)	Agreed strategies

Session M.2.2:

Hazard Assessment

The purpose of hazard assessment is to specify the nature and behavior of the potential hazards and threats people face.

Hazard is an event or occurrence that has the potential for causing injuries to lives and damaging property and the environment.

Hazard assessment means the identification of hazards in a given location (*D&E Reference Center 1998*).

Hazard assessment is a process of estimating, for defined areas, the probabilities of the occurrence of potentially damaging phenomenon of given magnitudes within a specified period of time (*Simeon Institute 1998*).

Table 2.2: Classification of Hazards

Natural disasters	Earthquakes, floods, hurricanes, land and rockslide, droughts, volcanic eruptions, forest fires, tsunami, and storm surges.
Technological (Man induced)	Hazardous material, transportation accidents, explosions, epidemics, fires, collapsed buildings.
Internal disturbances	Riots, demonstrations, prison breaks, strikes, terrorism.
Energy and Material Shortages	Strikes, labor problems, price wars, Embargo.
Armed conflict Armed conflict	Nuclear or conventional, chemical or biological warfare.

Underlying causes of the possibility of any new hazard occurrence are:

- **Natural:** Change in the patterns of weather leading to new forms of drought and floods
- **Economic:** Drastic fluctuations in real values of currency affecting immediate livelihood; other trade related policy changes, structural adjustment measures
- **Social and Political Trends:** Change in policy for poverty reduction, subsidy programs, re-locating people
- **Political Structures:** Structural changes within the country such as decentralization / centralization, conflicts
- **Industrial hazards:** Chemical accidents, poisoning of different kinds

- Epidemics: New forms of epidemics such as AIDS

Table 2.3: Associated Secondary Hazards

Primary Hazard	Secondary Hazard
Floods	Epidemics, snake bite
Drought	Epidemics, famine
Earthquake	Landslides, Collapse of building, ground subsidence spring change position
Civil War	Refugees, epidemics
Landslides	Epidemics
Pollution	Disease

To understand the nature and behavior of hazards, we need to consider following factors:

- Origin: The factor or factors which create / result in a hazard. It can be natural or man-made.
- Warning signs and signals: Scientific & indigenous indicators that hazard is likely to occur
- Forewarning: Time gap between warning signs and the impact of hazard
- Force: Factors that make the power of hazards e.g. intensity and magnitude of an earthquake
- Speed of Onset: Rapidity of arrival and impact
- Frequency: Time related patterns of occurrence of hazards
- Seasonality: Occurrence of a hazard in a particular time of the year
- Duration: Hazard's presence in a time scale

Small-scale and localized hazards that neither hit the headlines nor appear in disaster statistics have been increasing significantly. Collectively, these can present a more serious problem than any catastrophic event. For example, in densely populated shanty-towns, fires and epidemics are increasingly common events.

Table 2.4: Origin or Causes of Hazards

Hazard	Origin or Causes
Cyclone	Wind currents that spin
Floods	River and coastal rising of water due to intense rainfall, ill-planned structural Measures
Drought	Rainfall deficit over long time periods
Environmental Pollution	Caused by air, marine & fresh water pollutant
Deforestation	Cutting forests for livelihood and commercial purposes
Earthquake	Shaking of earth by the waves below the earth's surface
Landslides	Down slope transport of soil & rock by natural vibrations, changes in direct water content or removal of lateral support
Epidemic	Rise in parasitic infestations due to exposure to toxin

Following are some important points to be considered in Hazard Assessment:

- Look at scientific and statistical data
- Take action to translate scientific data into practical information
- Approach other knowledgeable sources / people
- Understand various intensities of the same hazard

Fig 2.1: Flooding in Rawalpindi City along with Nala Lai

Source: Pakistan Meteorological Department Islamabad, 2010

Participatory Risk Assessment tools for Hazard Assessment: There are several tools that can help in hazard assessment but the most commonly used tools are as following:

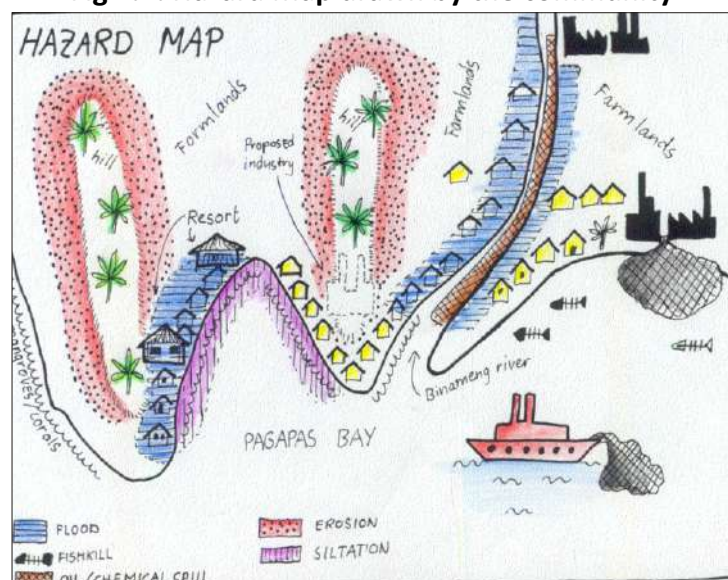
A. Hazard Mapping: Such kinds of maps can be used to locate the probable areas which can be affected by a potential hazard.

The community members know the hazards that confront their communities. Therefore hazard mapping allows the community members to identify graphically the hazard prone areas in the community.

The community members will draw maps using sticks or their fingers on the ground. Point to be remember is that;

- The process shouldn't be unnecessarily interrupted. The note taker will have to copy the map on his/her notes.
- The facilitator asks the community members to identify a landmark in the community.
- Initially, the facilitator puts a mark or a stone to stand for the landmark.
- The facilitator asks the community members to draw the boundaries of the community.
- This will be followed by drawing the location of houses, critical facilities and resources in the community.

Fig 2.2: Hazard Map drawn by the community



Source: CBDRM participants guide book (ADPC Thailand, 2007)

B. Historical Profile or Time Line: Can help understand how hazards changed over period of time; which hazards have happened in the past; or the start of particular hazard occurrence.

Historical profile is the graphic presentation of the history of disasters and development in the community. Community members can review their history based on primary data collection along with the older people of the community as they have history in mind and remember past important events. Besides secondary data from different offices will further help to verify the information.

After hazard mapping, historical profile can be used to explain the causes and effects of disasters in the community.

- The facilitator asks the community members about the impact of disaster/s in their lives.
- Facilitator writes the year the disaster/s took place.
- A follow up question on the causes of the disaster/s is asked by the facilitator. Answers are written initially

by the facilitator. Facilitator then asks the community members if there were those kinds of disasters maybe fifty years ago. Facilitator suggests that community members review their community history fifty years back or 30 years back, dividing the period every 10 or 5 years.

- Recording the answers is then handed over to a member of the group.

- B. Seasonal Calendar:** Seasonality is an expected "threat" and is usually coped with most years. This is where information needed to be obtained in order to know the people's coping strategies. For this purpose, the most useful tool is the seasonal calendar which is a participatory tool to explore seasonal changes and its impact on the community life and activities (e.g. gender-specific workload, diseases, income, expenditure etc.)

Besides, seasonal calendars show the 'temporal dimension' of the resource use. They are diagrammatic representations of the various activities, problems and opportunities that occur at different times of the year, and which have an effect on people's lives and activities.

- Different community members use different ways to mark the calendar. Some draw straight lines to indicate the months of the rainy and summer seasons. Others use a tick (✓) or (X) per month to say that these are the cold or the hot months. Still, others use symbols like the sun to indicate summer or rice stalks to indicate harvest season. There are many creative ways people use to express themselves.

Fig 2.3: Time line diagram



Source: CBDRM Participant guide book (ADPC Thailand, 2007)

D. Hazard Matrix:

Helps to systematize information on the characteristics of hazards, specifically warning signs and signals, forewarning, speed of onset, frequency, period of occurrence and duration

Table 2.5: Hazard Matrix

Hazard Type	Origin	Warning Signs	Fore-warning	Force	Speed of Onset	Frequency	Seasonality	Duration
Flood	Rain, River Overflow	Rainfall duration, Intensity, Quality, Speed of wind, Temperature, Movement of animals, insects and birds	Relatively short but can vary from a few hours to a few days	Volume of water	Can often be predicted a few days in advance	Seasonal	Monsoon season	Duration

Session M.2.3:

Vulnerability Assessment

- Vulnerability is the extent to which communities, structure, service or geographic area is likely to be damaged or disrupted by the impact of a particular hazard.
- Vulnerability is a complex combination of interrelated, mutually reinforcing and dynamic factors.
- Vulnerability analysis is the process of estimating the susceptibility of 'elements at risk' to various hazards.
- Vulnerability assessment the second level of hazard assessment combines the information from the hazard identification with an inventory of the existing property and population exposed to a hazard. It provides information on who and what are vulnerable to a natural hazard within the geographic areas defined by hazard identification. Vulnerability assessment can also estimate damage and casualties that will result from various intensities of the hazard (*Deyle et al. 1998, 129*).

Types of vulnerability

Physical/ Material Vulnerability : Pertains to the man-made environment of infrastructure, and the natural environment of agriculture, and forestry. It is not limited to the geographical location of population, buildings and crops. This also pertains to the physical capacity of buildings to cope with the battering of forces. The following are factors that determine the magnitude of physical vulnerability:

Fig 2.4: Vulnerable house located near steep cliff in Chitral



Source: NDMA Islamabad, 2010

Disaster-prone location of community, houses, farmlands, infrastructure, basic services, etc.

- Insecure and risky sources of livelihood
- Lack of access and control over means of production (*land, farm inputs, animals, capital, etc.*)
- Dependence on money-lenders / Aarhtis etc.
- Inadequate economic fall-back mechanisms
- occurrence of acute or chronic food shortage
- Lack of adequate skills and educational background
- Lack of basic services (*education, health, safe drinking water, shelter, sanitation, roads, electricity, communication, etc.*)
- High mortality rates, malnutrition, occurrence of diseases, insufficient caring capacity
- Over exploited natural resources
- Domestic violence, community conflicts, or war

Socio-Cultural Vulnerability: Elements or factors, which come from demographic concerns such as population density and level of awareness. Following are key issues to be considered in assessing social vulnerability:

- Special categories of vulnerable groups of people i.e. single parents, women, pregnant mothers, Mentally and physically Challenged, children and babies, elderly.
- Population density which has a strong correlation with casualties. It is necessary to assess areas of hazards in relation to where people work and live.
- Common perception and beliefs of the community about hazards, its impact and corresponding mitigation measures.
- Weak family / kinship structures

Fig 2.5: Vulnerable house in Hyderabad City



Source: NDMA Islamabad, 2010

Organizational / Institutional Vulnerability: Vulnerability factors which come from organizational or institutional concerns include:

- Lack of leadership, initiative, organizational structures to solve problems or conflicts
- Ineffective decision-making, people / groups are left out, etc.
- Unequal participation in community affairs
- Rumors, divisions, conflict (*ethnic, class, religion, caste, ideology, etc.*)
- Weak local institutions (government, private organizations) that cater to assisting / responding to the pre-disaster and disaster needs of the community
- Lack of access to political processes
- Inconsistency in organizational dynamics which determines how they respond to disasters.

Economic Vulnerability: Pertains to how people make their living and where they get their livelihood. Determining which type of livelihood is easily affected by disasters is a key issue to be considered in determining the magnitude of economic vulnerability.

Attitudinal / motivational Vulnerability: Refers to the individual's perception of risk and his / her ability to mitigate and cope with disasters. This also addresses the people's sense of priorities. Those who perceive disasters as uncontrollable events are harder hit than those who believe that disasters can be mitigated or avoided. The elements of this type of vulnerability include:

- Negative attitude of communities / individuals towards change
- Passivity, fatalism, hopelessness, dependence
- Lack of spirit for taking initiative
- Lack of unity, cooperation, solidarity
- Negative beliefs / ideologies
- Unawareness about hazards and consequences
- Dependence on external support

Things to remember:

- Vulnerability assessment framework must be simple enough to be useful, but complex enough to capture reality
- Vulnerability is specific to location, sector, interest group, etc.
- Vulnerability is dynamic
- Vulnerability is sometimes irreversible
- Vulnerability and poverty are strongly linked with each other.

(M.B. Anderson)

The following guide questions may help the community in accomplishing the Vulnerabilities Assessment Matrix:

Table 2.6: Vulnerabilities Assessment Matrix

Physical / Material	Socio-Cultural	Organizational / Institutional	Economic	Attitudinal / Motivational
<ul style="list-style-type: none"> ◆What are the ways The community may be physically vulnerable (land, climate, environment, people's health, infrastructure, food, housing, physical technologies)? What adjustments can be made to strengthen existing structures? Are building codes adequate? Are codes enforced? 	<ul style="list-style-type: none"> ◆What Measures are being Taken to develop community awareness and capacities to reduce disaster impact? ◆What social structures in the community are Vulnerable? ◆How can social activities be improved? How can conflicts / division within the society be reduced? 	<ul style="list-style-type: none"> ◆What formal and informal systems are vulnerable? ◆How can decision-making be improved? How can leadership be improved? 	<ul style="list-style-type: none"> ◆How can economic activities be improved? ◆What measures are being taken to diversify economic activities to reduce vulnerability/ What are The vulnerable livelihoods in the area? 	<ul style="list-style-type: none"> ◆How does The community view itself and its ability to deal with the physical, social and political environment? ◆ Do the people feel they have the ability to shape lives do people feel Victimized

Although poverty and vulnerability are closely related, they are not synonymous. While people are vulnerable to a hazard because of physical proximity combined with low economic or social status, it is not only the poor who reside in hazard-prone places. When personal, community or national wealth is inadequate even for basic daily security, few investments are made in measures that can help to ensure survival from hazard exposure. On the other hand, in upscale residential areas, which are built on hills and shores, design and engineering technologies are applied to minimize risk but do not eliminate it.

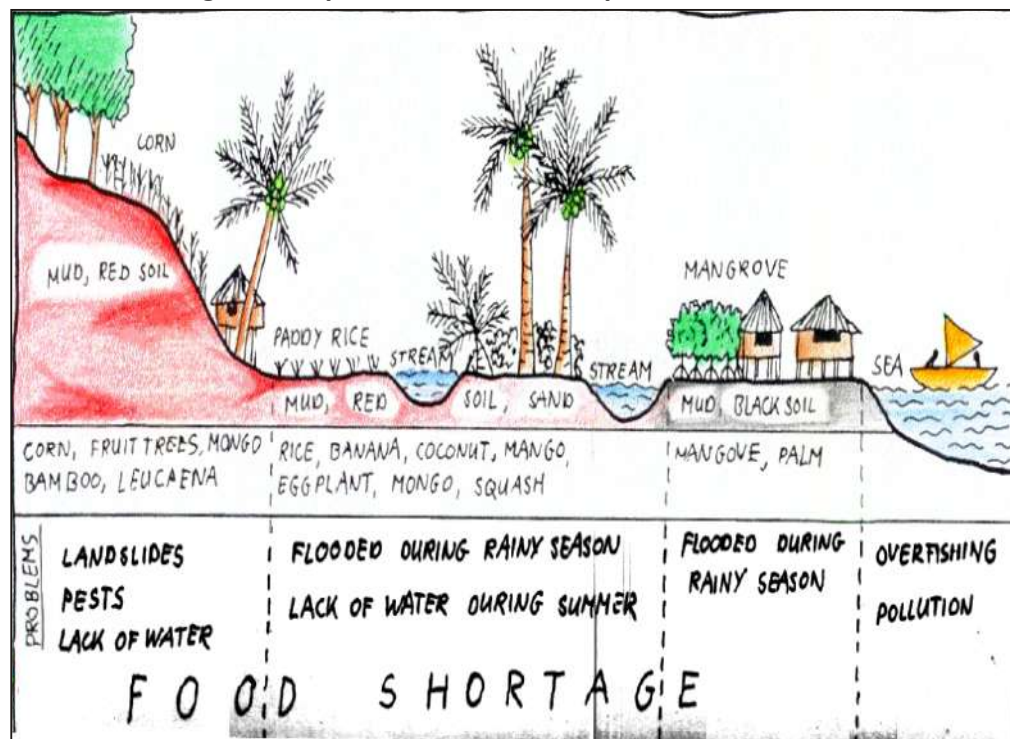
Participatory Risk Assessment tools for Vulnerability Assessment: A variety of tools can be used to enrich the community's participation in assessing vulnerability: These include the following:

- A. **Hazard Maps:** visualize the elements at risk. *This part has been explained in the hazard assessment session*
 - B. **Transect Walk:** A transect walk is a tool for describing and showing the location and distribution of resources, vulnerable areas/features/landscape, and main land uses along a given transect. It also gives a better understanding of the map done by the community and provides opportunities to ask more questions regarding physical / material vulnerability.
- The facilitator can discuss with community members the kind of information needed from this activity i.e. areas at risk to flooding or fire, resources available and which may be at risk too, critical facilities and others.

Fig 2.6: Map Drawn with the help of transect walk

- Get advice from community members what direction to take and the best path to follow.
- Walk with community members who can give information while transect walk is being made.
- Facilitator and note taker write down their observations and input from community members

Draw the map after the transect walk and validate with key informants from among community members.



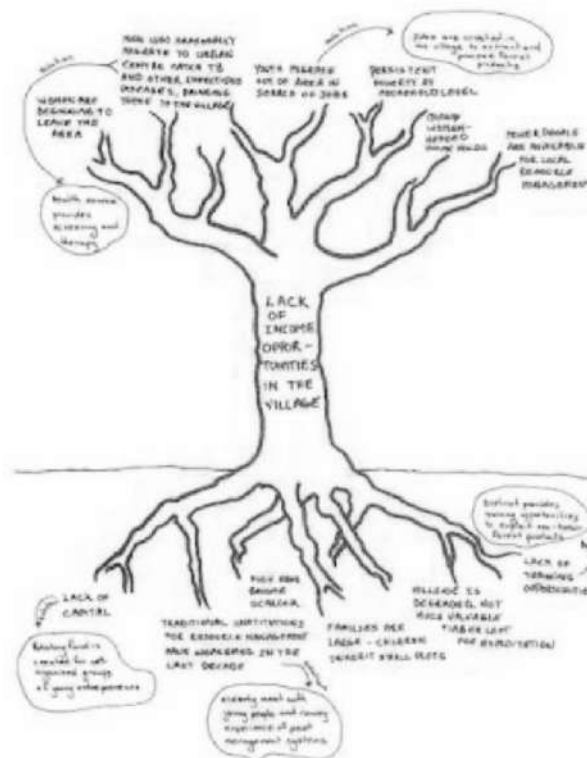
Source: ADPC Thailand 2005

- C. **Seasonal Calendar:** This tool gives insight in periods of stress, diseases, hunger, debt, etc. *(This part has been explained in the hazard assessment session)*
- D. **Venn Diagram:** shows the state of coordination among organizations and government agencies, or leadership patterns. It also depict different kinds of vulnerabilities because if coordination is not there, the community are more and mopre vulnerable and they cant get benefit from the organizations *(This part has been explained in the capacity assessment session).*
- E. **Problem Tree:** This tool use to identify local major problems/vulnerabilities as well as root causes and effects which make the people more and more vulnerable. This tool assists in analyzing an existing situation by identifying the major problems and their main causal relationships. The output is a graphical arrangement of problems differentiated according to 'causes' and 'effects,' joined by a core, or focal, problem. This technique helps understand the context and interrelationship of problems, and the potential impacts when targeting projects and programs toward specific issues.

The facilitator can draw problem tree with the support of other tools and interviewing. In this way, the team can learn the various concerns and problems

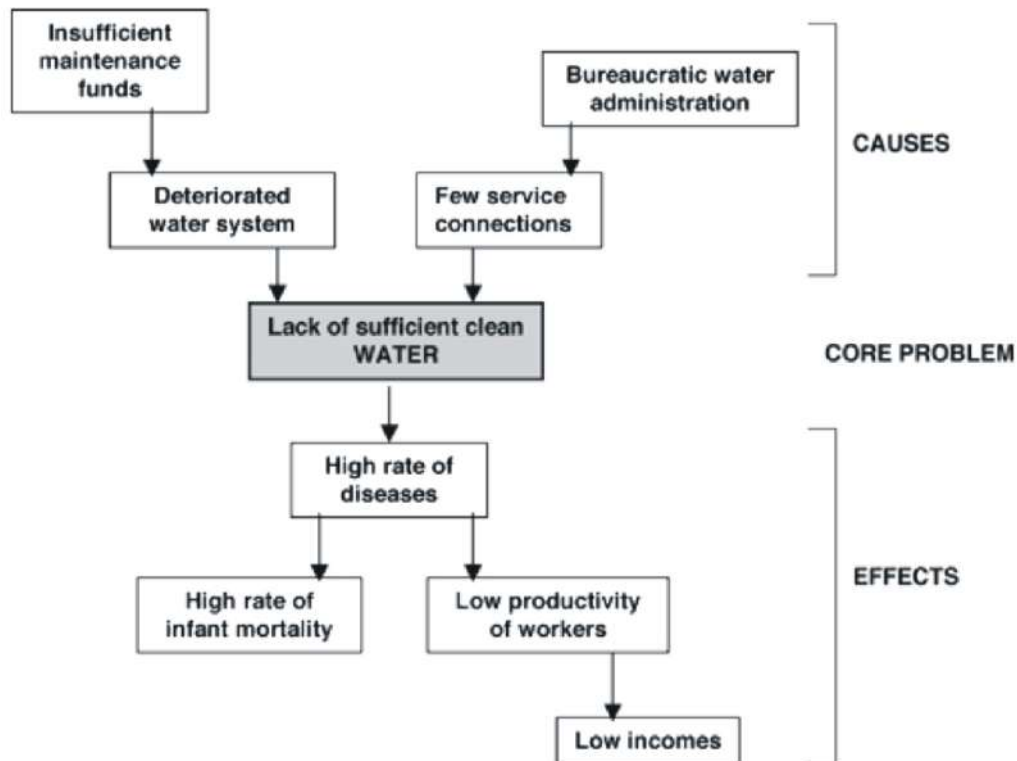
The facilitator will give all gathered people small pieces of papers and ask them to write one major problem on each card, and to put these on the wall. Ask two or three volunteers to group the problems according to similarity or interrelationship. Now the making of the 'problem tree' can start the trunk represents the problems; the roots are the causes; the leaves are the effects.

Fig 2.7: Example of a problem tree



Source: http://www.wri-irg.org/system/files/images/Problem_tree-400.img_assist_custom.jpg

Fig 2.8: Schematic diagram of the Problem tree



Source: <http://web.mit.edu/urbanupgrading/upgrading/issues-tools/tools/problem-tree.html>

F. Semi-structured Interviews: SSI use to get information (*general and specific*), to analyze problems, vulnerabilities, capacities and perceptions and to discuss plans etc. SSI are discussions in an informal and conversational way. SSI do not use formal questionnaire but at the most a checklist of questions as a flexible guide. There are different type of SSI:

- Group Interview
- Focus Group Discussion
- Individual Interview
- Key-Informant Interview

G. Ranking: This tool enables community members to express their main vulnerabilities and which one they prioritize to be addressed.

Ranking is a useful tool for assessing the relative importance of different activities in people's livelihoods. A matrix is a double entry grid that can be used to analyse two sets of variables.

Fig 2.9: Data collection through SSI



Source: ADPC Thailand 2005

Some PRA facilitators find it hard to use matrix ranking because indicators can be difficult to establish. If community members are asked what indicators they use, they may not be able to understand what PRA facilitators mean.

- PRA facilitator or community member lists down the hazards. This list can be extracted from the seasonal calendar and mapping activities.
- The facilitator then asks the community members for the impact of the hazard. Broad categories are impact on life, property, critical facilities like irrigation, public buildings, and the environment. For example, the facilitator can ask: "What happens to your house when there is a flash flood?"
- Try asking at least one impact per hazard. The list of impacts can be used as the set of indicators. See the example below.

Ask the community members to look at the list of indicators

Fig 2.10: Ranking method for prioritizing the risk



Source: CBDRM participants guide book (ADPC Thailand, 2007)

Session M.2.4:

Capacity Assessment

All natural hazards do not become disasters. Sometimes, they cause no major damage to life or property because they occur where no one lives or because people have taken measures to prevent or reduce their damaging effects. Even when these events do cause damage, not everyone in a disaster area suffers equally. Why it is some people suffer more from disasters than other people? The answer is that some people have fewer capacities and are more vulnerable than others.

Capacity is a community's actual or potential ability to withstand disasters through the presence of material and human resources that aid in the prevention and effective response to disasters. This includes the resources and skills people possess, can develop, mobilize or have access to which allow them to have more control over shaping their future. It is the ability of the community to deal with hazards and their attendant impact.

Capacity assessment is the process to determine what people do in times of crisis to reduce the damaging effects of the hazard, and to secure sustainable livelihood by:

Understanding people's previous experiences with hazards that enabled them to develop coping strategies

Analyzing which resources are available and used by the community to reduce risk, who has access to these resources and who controls them.

Assessing capacities of people at risk is a very important step in choosing strategies for community disaster risk reduction and capability building. It is a step in the risk assessment process that most people forget. When we put it aside, we can make mistakes in program design and waste scarce external resources.

Capacities can be classified as following:

Physical / Material Capacities: People with economic and material resources can survive better. These may come in the form of cash, land, tools, food, jobs, or access to credit. The appropriateness and abundance of people's resources make a difference as to whether they can handle or control any kind of threat and whether they can lead a satisfying and dignified life. For example, people with access to food and clean water have better health to withstand disease; those with the means can afford materials and skills to make their homes almost cyclone proof.

Fig. 2.11: An old women is crossing a broken bridge



Source: NDMA Islamabad, 2010

Fig. 2.12: Narrow Street as an escaping route during flooding in Hyderabad



Source: NDMA Islamabad, 2010

Social / organizational Capacities: People have social resources that help them cope with, resist and handle the threats they may face. For example, communities that are close-knit and have social networks for support are stronger. Communities where good leadership, caring local and national institutions are in place, and where people share the physical resources they have in times of need are more likely to survive. These communities may be economically poor but can be socially strong.

Attitudinal / Motivational Capacities: People, who are aware of their abilities and have confidence in themselves, are better able to cope with a crisis. When they have a sense of control over events and the power to change their condition, they are less vulnerable to threats.

Coping and Coping Mechanisms: 'Coping' means 'managing resources' in adverse situations. Coping can include defense mechanisms, active ways of solving problems, and methods for handling stress. Coping mechanisms are employed when vulnerable communities face difficulties in recovering from a disaster. Their livelihood has become unstable; they face food shortages and even hunger. However, previous experiences with seasonal problems and hunger itself have enabled communities to develop coping strategies. Immediate concern is to secure livelihood than maintaining food supplies. People would rather eat less than be forced to sell livestock or tools, which would undermine their livelihood in the long-term. (Maxwell, 1996)

Sequence of Coping Strategies:

- **Stage 1:** At the first stage, communities develop an indigenous coping mechanism to deal with disasters. For instance, they develop a warning system, evacuation routes and places, and coordinate relief efforts. They also rely on kinship relations during crisis. People bank on these capacities in pre

and during disaster situation to minimize the loss of life and property.

- Stage 2: The following strategies are employed to overcome normal seasonal stress, when a number of factors converge into a weakening food supply basis:
 - Short-term dietary changes
 - Change in farming practices and patterns
 - Diversification of income sources
 - Temporary migration in search of work during lean months in the farming calendar
 - Sale of non-essential possessions
 - Sale of animals

- Stage 3: In case of prolonged stress, strategies take a shift from solving long-term problems to short-term gains. Stress often causes change in gender roles and responsibilities; productive and reproductive tasks are done regardless of gender since priority remains on income-generating sources, which include:
 - Essential livestock is sold
 - Seeds for next cropping season are consumed
 - Agriculture tools are sold
 - Money is borrowed from outside on high interest rates
 - Land is mortgaged or sold
 - Migration
 - Sale of essential household belongings
 - Begging

- Stage 4: At this stage, the affected population is left with no other option but to take extreme measures such as:
 - Raids on the warehouses of the Government or NGOs where food is stockpiled
 - Permanent out-migration of whole family
 - Residing in relief camps for emergency food
 - Begging

- Stage 5: Starvation and death

Coping strategies at community level do not always work but certainly contribute in ensuring survival during disaster. The standard practice of relief agencies usually comes during fourth and fifth stage when affected families threaten to raid warehouses

If the outsiders ignore existing resources at household and community level during the process of designing risk reduction measures, their indigenous coping mechanisms may be undermined that eventually lead to increasing people's vulnerability.

Participatory Risk Assessment tools for Capacity Assessment:

- a. **Hazard Map:** *Already discussed in hazard assessment session*
- b. **Historical Profile:** *Already discussed in hazard assessment session*
- c. **Seasonal Calendar:** *Already discussed in hazard and vulnerability assessment sessions*
- d. **Resource Mapping:** This tool is used for making a map showing local resources and capacities on which the communities can rely on the times of disasters and Identify which resources are easily affected by disasters

Some of the Key Questions which are useful for the resource mapping;

- What resources are abundant?
- What resources are scarce?
- Does everyone have equal access to land?
- Do women have access to land?
- Do the poor have access to land?
- Who makes decision on land allocation?
- Where do people go to collect water?
- Who collects water?
- Where do people go to collect firewood?
- Who collects firewood?
- Where do people go for grazing livestock?
- What kind of development activities do you carry out as a whole community? Where?
- Which resource do you have the most problem with?

Fig. 2.13: Resource Mapping

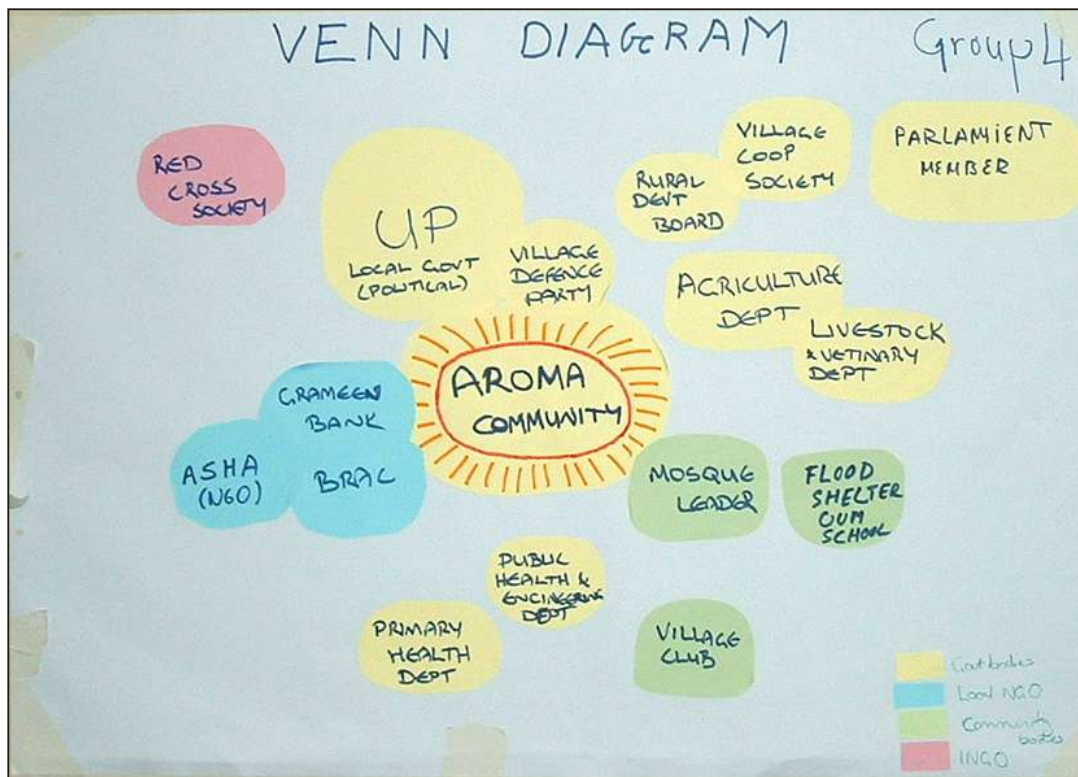


Source: ADPC, Thailand 2005

E. Institutional and Social Network Analysis through Venn diagram: The tools used to for making a diagram that shows key-organizations, groups and individuals in a community & nature of relationship and level of importance. This tool can be useful for exploring relationships between things particularly the relative importance, influence or power of people, organisations or groups.

This tool also called as Chapati diagrams and can be very helpful in structuring the analysis of complex dynamics or relationships between people, groups or organisations. They can also be used to explore the relative importance of different influences on a person or process.

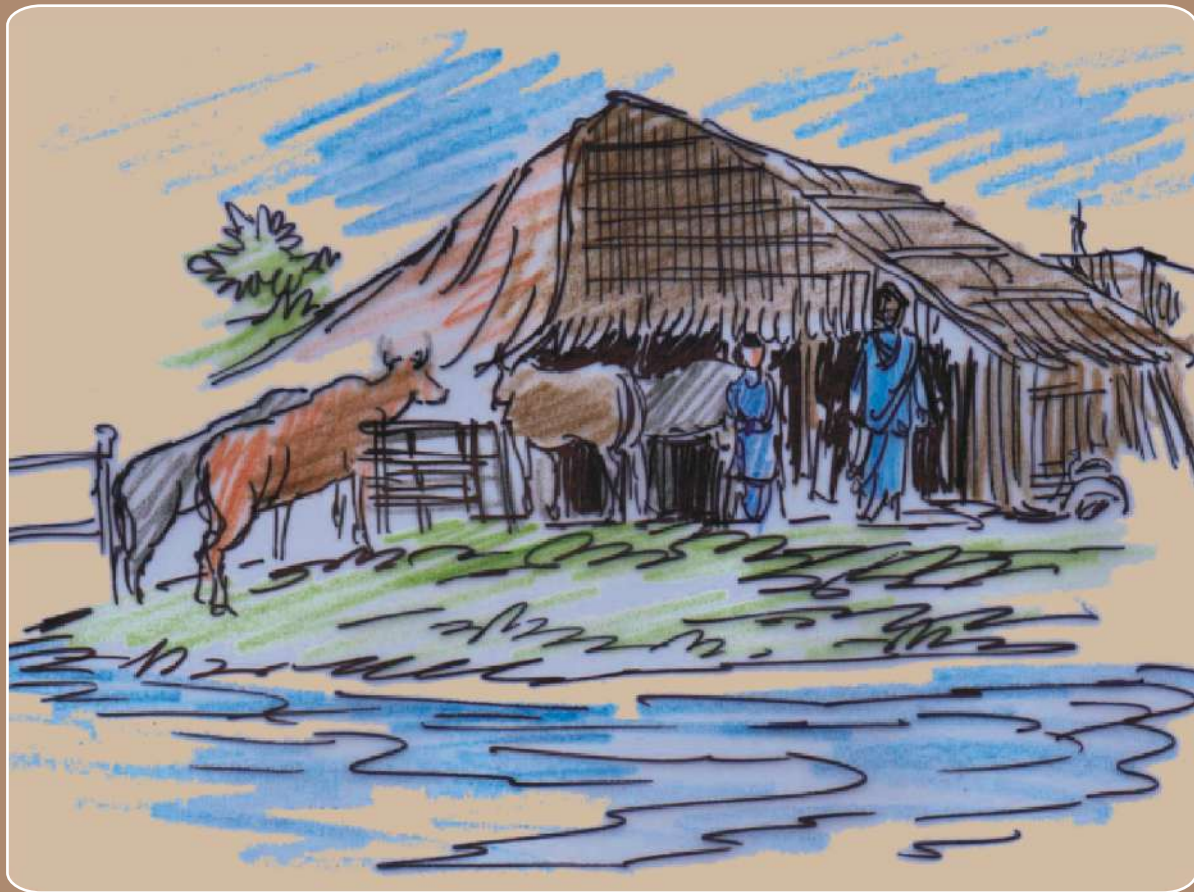
Fig 2.14: Venn Diagram use for Community Social and Institutional Network

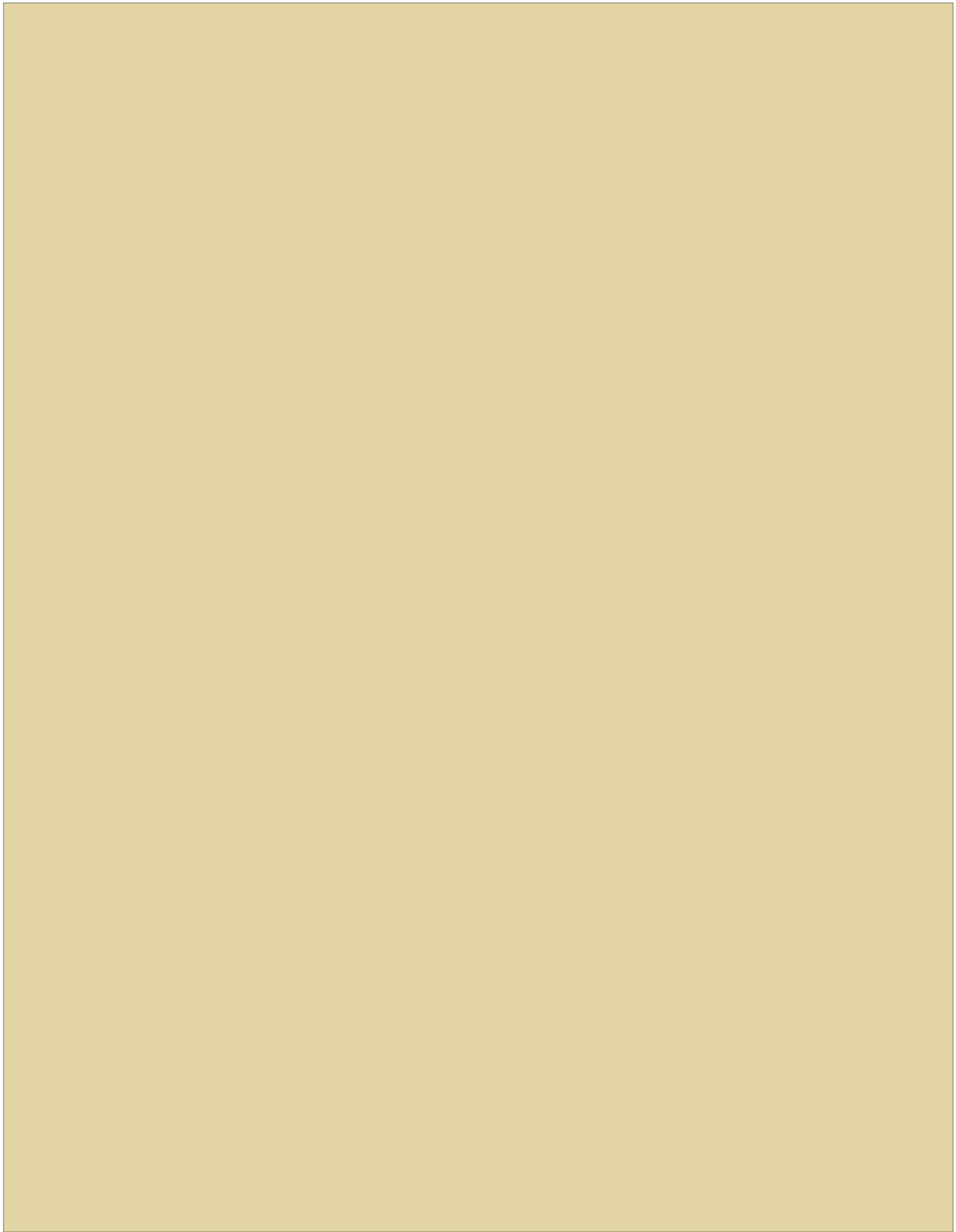


Source: CBDRM participants guide book (ADPC Thailand, 2007)

Module 3:

Disaster Risk Assessment Operational Areas





Session M.3.1:

Prevention and Mitigation Framework

1. Major Mitigation Components

Certain major components or activities generally apply to mitigation programs. These are covered below under the headings of non-structural mitigation and structural mitigation.

1.1: Non-Structural Mitigation

Legal framework: Generally speaking, existing disaster-related legislation tends not to place enough emphasis on mitigation. In establishing or reviewing such legislation, therefore, it may be advantageous to ensure that mitigation requirements are adequately covered. Land-use planning and the application of building codes provide some legal basis for successful mitigation. However, both these aspects tend to fall short of full effectiveness unless they are rigidly enforced.

Incentives: Incentives can often provide better inducements for mitigation than legal impositions. Government grants or subsidies may help to persuade commercial and other institutions to include mitigation measures in their building or reconstruction activities. The provision of government technical assistance can help towards the same end. Insurance can also provide useful incentives: for instance, insurance companies may be persuaded to offer reduced premiums for buildings, once hazard-resistant measures have been incorporated.

Training and education: If mitigation is to be successful, its requirements must be widely known and understood. Therefore, there is a need to train and educate all those involved, including disaster risk management officials, construction specialists and the general public. In this regard, public awareness programs can provide an important foundation by informing people generally of the need for and benefits of mitigation programs. In a more specific sense, programs of training and education are necessary to ensure that mitigation programs would be supported and properly implemented. Four target groups are especially important:

- Public officials who play a vital role in disaster risk management. Appropriate training modules should be incorporated in their career-path training programs and opportunities provided to them to attend specialist courses.
- Technical students whose professional education should include disaster mitigation courses.
- Small builders and craftsmen who may be given on-the-job training in simple mitigation practices.
- School children who should be introduced to simple mitigation measures in the context of environmental studies, natural science or geography classes.

Public awareness: In addition to general awareness, certain particular areas of public involvement are necessary for effective implementation of mitigation programs. These include:

- A good public knowledge and understanding of local hazards and vulnerabilities.
- Public awareness of the kind of mitigation measures which can be applied.
- Public participation in community preparedness programs.

Governments can substantially assist public awareness of safe mitigation practice by ensuring that their own public buildings (such as post offices, tools, hospitals, government offices) and services are built to high safety standards. This will also help to ensure that designers, builders and engineers gain experience in safe construction and, at the same time, contribute to a safer environment.

Institution building: The strengthening of a country's or community's social structure can enhance disaster mitigation capacity. Such strengthening is, however, difficult to achieve. Three possible ways are to extend normal development as follows:

- First, through institution building; Organizations that serve as coping mechanisms can be identified and strengthened. A deliberate effort can be made to increase their institutional capacities and skills thus enhancing their ability to deal with a crisis.
- Second, through increasing the number of coping mechanisms within a country or community. By developing formal institutions and linking them to outside resources, means are established for intervention and the provision of assistance.
- Third, through encouraging actions that promote co-operation among different groups within society. Such cooperation can considerably reduce the social impact of disasters.

In their development activities, both government and non-government agencies should be careful to avoid actions that will further increase or institutionalize a society's vulnerability. It is especially important to identify institutional dependency relationships, particularly those that may be increased in a disaster situation, and work to eliminate them. By increasing self-sufficiency, agencies may improve the ability of families and communities to cope with disasters. This can be a mitigating factor and could help speed recovery. Strong -institutions can play a vital role in various aspects of mitigation, such as promoting public awareness programs, training at community levels and monitoring hazards and vulnerabilities.

Warning systems: Various modern developments have significantly improved the ability of disaster management authorities to provide effective warning of impending disasters. Better warning systems have, for instance, been instrumental in evacuating vulnerable groups, moving livestock to safety and mobilizing emergency services and resources. In the particular context of mitigation, three matters are underlined here.

- The steps between the issuing of warning and the taking of action by relevant authorities or vulnerable people are critical.
- Evacuation should only be ordered when there is virtual certainty of hazard impact; a false evacuation order for a hazard that does not materialize can destroy public confidence in the warning system and neutralize several years of preparedness planning.

- To the extent possible, the dissemination of warnings should use duplicate systems to ensure effectiveness. For example, radio messages backed up by siren warnings; warning flags backed up by house-to-house visits by local wardens.

1.2: Structural Mitigation

Non-structural mitigation measures may need to be complemented by structural measures. In the case of flood-prone areas, embankments, regulators, drains or by-pass channels can be provided, where appropriate, to protect areas from damage by floods. Techniques to mitigate the effects of earthquakes, cyclones and floods on structures also exist. Structural mitigation measures may apply to both engineered structures and non-engineered structures.

Engineered structures: Engineered structures involve architects and engineers during the planning, designing and construction phases. They may include buildings ranging in scale from simple dwellings to multi-story office blocks, as well as infrastructure such as electricity pylons to dams, embankments, ports, roads, railways and bridges. While professionals are trained to plan, design and supervise the construction of buildings and infrastructure to achieve necessary structural safety standards, they may need additional training to incorporate mitigation practices into their design of structures resistant to seismic shock, storm winds or floods. The application of sound technical principles is achieved through:

- Site planning;
- Assessment of forces created by the natural phenomena (earthquake, typhoon and flood);
- The planning and analysis of structural measures to resist such forces;
- The design and proper detailing of structural components;
- Construction with suitable material; and
- Good workmanship under adequate supervision.

Most countries have building codes for engineered construction. These codes provide general guidelines for the assessment of forces and further analysis, appropriate design methodologies and construction techniques. If a country does not have a building code which specifies design and construction requirements for earthquake and wind forces, such a code should be formulated as soon as possible, technical personnel trained in its use and enforcement ensured. The quality of construction is as important as good analysis and design. Good workmanship must be encouraged by appropriate training and supervision to achieve better performance.

Non-engineered structures: Non-engineered structures are those constructed by their owners themselves or by local carpenters and masons who generally lack formal training. Such structures mainly comprise simple dwellings and public buildings, built with local materials in the traditional manner. In some disasters, high casualties and economic losses can be attributed to the failure of non-engineered structures. The improved designs vary according to the many different traditional ways of building that suit various cultures, climates, available skills and building materials.

Another important aspect of increasing the safety of non-engineered structures is to try to ensure that they are not built on hazardous sites such as steep slopes subject to landslides, floodplains subject to flash floods or river bank erosion, or coastal areas exposed to storm surges. However, people often do not want to leave their traditional homes and the area in which they have been living for generations, even though the location may be hazard prone. Economic pressures may also induce people to settle in hazardous areas. Wherever practical, incentives should be offered to attract people out of hazardous locations; alternatively, consideration may be given to substituting appropriately engineered structures where this might be practical and economic, or mitigation measures introduced in non-engineered constructions so as to enhance their safety.

2. Formulation and Implementation of Mitigation Programs

The requirements and circumstances for formulating and implementing mitigation programs are likely to differ in various countries. However, the information given should be of general assistance.

- If possible, a simple broad strategy should be devised to cover foreseeable mitigation requirements. This strategy should contain component programs, with desirable priorities.
- The strategy should be interlocked, as far as possible, with national development planning, environmental considerations and other disaster risk management activities.
- A system for monitoring and reviewing the strategy should be introduced and applied.
- Responsibility for overseeing and coordinating mitigation activities should be clearly defined. Normally, this responsibility would be vested in the Minister/Official responsible for disaster-related affairs or the Commission on Emergency and Disaster Management, with clear down ward delegation. Responsibility for individual mitigation programs should also be clearly defined.
- There should be a requirement for an annual progress report covering mitigation activities; this should normally be embodied in an annual disaster risk management report to Cabinet.
- Mitigation activity should be regarded as a suitable and productive area for international assistance.
- Since many different agencies are likely to be involved in mitigation programs, the national disaster risk management office (*in the case of Afghanistan Department of Disaster Preparedness*) or section should be authorized (*on behalf of government*) to fulfill day-to-day liaison requirements, in order to ensure coordination of effort.
- For individual mitigation programs it is likely that a particular government ministry/department can be given the lead role. For instance, a mitigation program to protect and conserve a vital road system should be led by the Ministry responsible for roads.
- Mitigation programs should not be regarded as, or be allowed to become, a separate activity. They should be part of an integrated national program.

3. Guiding Principles of Mitigation

The following principles are widely recognized as providing a valuable guide to disaster mitigation.

3.1: Initiation

Disasters offer unique opportunities to introduce mitigation measures.

Mitigation can be introduced within the three diverse contexts of reconstruction, new investment and the existing environment. Each presents different opportunities to introduce safety measures.

3.2: Management

Mitigation measures are complex and interdependent, and they involve widespread responsibility. Therefore, effective leadership and co-ordination are essential to provide a focal point.

Mitigation will be most effective if safety measures are spread through a wide diversity of integrated activities.

"Active" mitigation measures that rely on incentives are more effective than "passive" measures based on restrictive laws and controls.

Mitigation must not be isolated from related elements of disaster planning such as preparedness, relief and reconstruction.

3.3: Prioritization

Where resources are limited, priority should be given to the protection of key social groups, critical services and vital economic sectors.

3.4: Monitoring and Evaluation

Mitigation measures need to be continually monitored and evaluated so as to respond to changing patterns of hazards, vulnerability and resources.

3.5: Institutionalization

Mitigation measures should be sustainable so as to resist public apathy during the long periods between major disasters. Political commitment is vital to the initiation and maintenance of mitigation.

Session M.3.2:

Drought Hazard Risk Management

Drought may be considered in general terms a consequence of a reduction over an extended period of time in the amount of precipitation that is received, usually over a season or more in length. It is thus a temporary aberration, which is a permanent feature of the climate. It should be noted that 'drought is a normal, recurrent feature of climate, and it occurs in virtually all climatic regimes. Droughts, however, have some unique characteristics that may require different approaches to reduce their impacts. Droughts differ from other natural hazards in several important ways:

- Slow-onset, creeping phenomenon that makes it difficult to determine the onset and end of the event;
- Duration may range from months to years;
- No universal definition;
- No single indicator or index can identify precisely the onset and severity of the event;
- Impacts are generally non-structural and difficult to quantify;
- Spatial extent is usually much greater than for other natural hazards, making assessment and response actions difficult, since impacts are spread over larger geographical areas;
- Because of their potentially long duration, the core area or epicenter will change over time, reinforcing the need for continuous monitoring of climate and water supply indicators
- Impacts are cumulative and the effects magnify when events continue from one season or year to the next;

The risk associated with drought for any region is a product of the region's exposure to the natural hazard and the vulnerability of societies within the region to the event. There is little efforts that can be done to alter its occurrence, because drought is a normal part of climate. Vulnerability to drought is determined by social factors such as land use, population increases and migrations from one region to another or from rural to urban areas. Water use trends, environmental degradation, technological changes, and government policies can also alter vulnerability to drought. Vulnerability is dynamic and the factors mentioned above must be monitored to determine how changes in these factors may influence the impacts of future drought episodes.

Table 3.1: Drought types

- ***Meteorological drought:*** A situation arising from inadequate and mal-distribution of rainfall;
- ***Hydrological drought:*** Conditions denote reduced stream flow and inadequate filling of reservoirs, tanks or drying up of water in the surface
- ***Soil moisture drought:*** Inadequate soil moisture particularly in rain-fed areas which may not support crop growth;
- ***Agricultural drought:*** characterized by low soil moisture levels and shortage of water resulting in crop failures;
- ***Socio-economic drought:*** the reduction of availability of food and income loss, on account of crop failures endangering food and social security of the people in the affected areas;
- ***Famine:*** when large scale collapse of access to food occurs which without intervention, can lead to Mass starvation; and
- ***Ecological drought:*** when the productivity of a natural eco-system fails significantly as a Consequence of distress induced environmental damage.

1. Impacts of Drought: The impacts of drought are diverse and often ripple through the economy. Thus, impacts are often referred to as direct or indirect, or they are assigned an order of propagation (*i.e. first, second, or third order*) (Kates, 1985).

The impacts of drought can be classified into three principal sectors: economic, environmental, and social. The economic impacts of drought are numerous, ranging from direct losses in the broad agricultural and agriculturally related sectors, including forestry and fishing, to losses in recreation, transportation, banking, and energy. Other economic impacts would include added unemployment, increases in food prices and overall disruption of food supply, strain on financial institutions because of farm foreclosures, increased costs of new or supplemental water resource development and loss of revenue to local, state, and federal government. Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; and soil erosion. These losses are difficult to quantify, but growing public awareness and concern for environmental quality has forced public officials to focus greater-attention on these effects. Increasing levels of environmental regulation (e.g. water quality, preservation of wildlife habitat) have imposed a new layer of constraints on water managers during water-short periods. This trend is likely to continue. Social impacts mainly involve public safety, health, conflicts between water users, inequities in the distribution of impacts and disaster relief programs, loss of life, increased social unrest, depopulation of rural areas, and reduced quality of life. The response could be guided by better understanding of drought. Drought is a slow onset natural hazard and it offers time and, opportunity to mitigate its impact.

2001 Drought in Pakistan

According to the Economic Survey of Pakistan, the drought was one of the most significant factors responsible for the less than anticipated growth performance. The survey terms it as the worst drought in the history of the country. According to the government, 40 percent of the country's water needs went unmet.

The drought has wreaked havoc in 58 of the total 106 districts of the country, especially impacting rainfed and rangeland areas. Causing devastation and loss of human lives in semi-arid regions, the drought eliminated of US \$ 247 million worth of livestock in the first five months of this year alone. Given that 70 percent of the entire population of Pakistan is rural based and dependent on agriculture for its livelihood, negative agricultural growth of 2.5 percent (estimated) has not only impacted agro-based industry, but displaced a large number of the rural poor. Massive migratory trends have been witnessed, therefore, to irrigated and urban areas. The losses of the agricultural sector will also trickle down to the banking and financial sectors, in view of farmers.

Source: <http://un.org.pk/drought/rcreport13.htm>

At the later stage, distress induced environmental degradation forces affect communities to take recourse to cutting down vegetative cover to cope with acute food shortages. The situation also results in land degradation and sharp falls in livestock population, upsetting the energy cycle of the ecosystem.

2. Household responses Pattern: Review of existing research on household responses in Asia and Africa to drought induced food crisis conclude that while conditions vary locally, there are identifiable behavioral pattern associated with onset, progression and climax of crisis The household response to drought induced food crisis generally involve a succession of stages along a continuum of “coping” that rums from risk minimizing effort through a crisis damage containment to the extreme! Instances of household collapse. The sequencing of household response strategies can be grouped according to their relative degree of reversibility. In the interest of simplification, these stages are grouped as (i) risk minimization (ii) risk absorption (iii) survival strategies.

Risk minimization strategies relate to minor adjustment in the resource allocation and utilization of household without much

outside help. Risk absorption strategies relied primarily on outside help to “tide over temporary dislocation caused by droughts”. Risk minimization and risk absorption strategies are reversible as none of these strategies affect the underlying basis of the victims' potential economy. Thus for the subsistence farmer, land, tools, seed and labor potential remains intact. For the Pastoralists the breeding herd is intact. For the landless laborers, his/her ability to work at peak employment periods is preserved. All these strategies are reversible. The Risk Survival Strategies undermine the basis of the victims' means of survival. The sale of essential assets like stock or land means that the household position is so desperate that they sacrifice future security for present survival (*Peter Walker, 1989*). The sequencing of household strategies in the wake of drought induced food scarcity is given below:

3. Risk Minimization Strategies

Table 3.2: Progression of household level coping strategies

Risk minimization	<ul style="list-style-type: none"> ○ Altering agricultural practices ○ Diversification of income sources ○ Pastorausts to hold mixed species of herds ○ Temporary migration in search of work ○ Drawing upon common property resources ○ Drawing upon social relationships
Risk Absorption	<ul style="list-style-type: none"> ○ Reducing and modifying consumption ○ Borrowing of repayable loans ○ Sale of non-productive assets ○ Participating in relief works
Risk Survival	<ul style="list-style-type: none"> ○ Disposing of productive assets ○ Distress migration ○ Reliance on famine foods
Household collapse	<ul style="list-style-type: none"> ○ Starvation ○ Death

Source: Climate Risk Management Division, ADPC Thailand, 1997

4. Mitigating Drought

Taking actions in advance of drought to reduce its long-term risk can involve a wide range of tools. These tools include policies, activities, plans, and programs. This section provides an overview of the tools that various government agencies have used in recent droughts, a number of drought plans and a 9-step drought planning process. (*Donald A. Wilhite Michael J. Hayes Cody Knutson Kelly Helm Smith*)

Because droughts are a normal part of virtually any climate, it is important to develop plans to reduce their impacts. The process discussed in this paper can be adapted to any level of government in any country.

Appoint a Drought Task Force

The drought planning process is initiated through appointment of a drought task force. The task force has

two purposes. First, it supervises and coordinates development of the plan. Second, after the plan is developed and during times of drought when the plan is activated, the task force coordinates actions, implements mitigation and response programs, and makes policy recommendations.

The task force should reflect the multidisciplinary nature of drought and its impacts, and it should include representatives of government agencies and universities (*e.g. representatives from extension, climatologists, policy specialists, planners*).

The task force should reflect the multidisciplinary nature of drought and its impacts, and it should include representatives of government agencies and universities (*e.g. representatives from extension, climatologists, policy specialists, planners*). Environmental and public interest groups and others from the private sector, including industries, can be included on the task force, and/or on sector-specific working groups of the risk assessment committee, or an advisory council, or they can be otherwise involved, as appropriate. The actual makeup of this task force would be highly variable between countries, reflecting the country's political and economic character.

State the Purpose and Objectives of the Drought Plan

As its first official action, the drought task force should state the general purpose for the drought plan. Officials should consider many questions as they define the purpose of the plan, such as the:

- Purpose and role of government in drought mitigation and response efforts;
- Scope of the plan;
- Most drought-prone areas of the country;
- Historical impacts of drought;
- Historical response to drought;
- Most vulnerable economic and social sectors;
- Role of the plan in resolving conflict between water users and other vulnerable groups during periods of shortage;
- Current trends (*e.g. land and water use, population growth*) that may increase/decrease vulnerability and conflicts in the future;
- Resources (*human and economic*) that the country is willing to commit to the planning process;
- Legal and social implications of the plan; and
- Principal environmental concerns caused by drought.

A generic statement of purpose for a plan is to reduce the impacts of drought by identifying principal activities, groups, or regions most at risk and developing mitigation actions and programs that alter these vulnerabilities. The plan is directed at providing government with an effective and systematic means of assessing drought conditions, developing mitigation actions and programs to reduce risk in advance of

drought, and developing response options that minimize economic stress, environmental losses, and social hardships during drought.

The task force should then identify the specific objectives that support the purpose of the plan. Drought plan objectives will, of course, vary between regions of the country and should reflect the unique physical, environmental, socioeconomic, and political characteristics of each region. At the region level, plan objectives will place less emphasis on financial assistance measures, than would the objectives of a national plan.

Support for educational and research programs should be a shared responsibility of provincial and national government. Objectives that provinces should consider include the following:

- Collect and analyze drought-related information in a timely and systematic manner.
- Establish criteria for declaring drought emergencies and triggering various mitigation and response activities.
- Provide an organizational structure and delivery system that assures information flow between and within levels of government.
- Define the duties and responsibilities of all agencies with respect to drought.
- Maintain a current inventory of provincial and national programs used in assessing and responding to drought emergencies.
- Identify drought-prone areas of the province and vulnerable economic sectors, individuals, or environments.
- Identify mitigation actions that can be taken to address vulnerabilities and reduce drought impacts.
- Provide a mechanism to ensure timely and accurate assessment of drought's impacts on agriculture, industry, municipalities, wildlife, tourism and recreation, health, and other areas.
- Keep the public informed of current conditions and response actions by providing accurate, timely information to media in print and electronic form (e.g. via TV, radio, and the World Wide Web).
- Establish and pursue a strategy to remove obstacles to the equitable allocation of water during shortages and establish requirements or provide incentives to encourage water conservation.
- Establish a set of procedures to continually evaluate and exercise the plan and periodically revise the plan so it will stay responsive to the needs of the province.

Seek Stakeholder Participation and Resolve Conflict

It is essential for task force members to identify all citizen groups that have a stake in drought planning (stakeholders) and their interests. These groups must be involved early and continuously in order to ensure fair representation and effective drought management. Discussing concerns early in the process gives participants a chance to develop an understanding of one another's various viewpoints, and to generate collaborative solutions. These groups are likely to impede progress in the development of plans if they are not included in the process. The task force should also protect the interests of stakeholders who may lack the

financial resources to serve as their own advocates. Public participation takes many forms. One way to facilitate public participation is to establish a citizen's advisory council as a permanent feature of the drought plan, to help the task force keep information flowing and resolve conflicts between stakeholders. Another way is to invite stakeholders to serve on working groups of the risk assessment committee.

Inventory Resources and Identify Groups at Risk

An inventory of natural, biological, and human resources, including the identification of constraints that may impede the planning process, may need to be initiated by the task force. It is important to determine the vulnerability of these resources to periods of water shortage that result from drought. The most obvious natural resource of importance is water: where is it located, how accessible is it, of what quality is it? Biological resources refer to the quantity and quality of grasslands/rangelands, forests, wildlife, and so forth. Human resources include the labor needed to develop water resources, lay pipeline, haul water and livestock feed, process citizen complaints, provide technical assistance, and direct citizens to available services. It is also imperative to identify constraints to the planning process and to the activation of the plan in response to a developing drought. These constraints may be physical, financial, legal, or political. The costs associated with the development of a plan must be weighed against the losses that will likely result if no plan is in place.

Develop Organizational Structure and Prepare Drought Plan

This step describes the process of establishing relevant committees to develop and write the drought plan and develop the necessary organizational structure to carry out its responsibilities. The drought plan should have three primary components: monitoring, risk assessment, and mitigation and response. It is recommended that committees be established to focus on the first two of these needs; the mitigation and response function can in most instances be carried out by the drought task force (Figure 1).

The drought task force, as originally defined, is composed of senior policy makers from various provinces and national agencies. The group should be in an excellent position to recommend and/or implement mitigation actions, request assistance through various national programs, or make policy recommendations to the legislature and governor.

Specific responsibilities of the task force at this point are to:

- Determine mitigation and response actions for each of the principal impact sectors, in close cooperation with the risk assessment committee. However, the transferability of these technologies to specific situations in other provinces needs to be evaluated further because they may not be directly transferable in some cases. Working with the risk assessment committee, the task force should come up with recommendations addressing drought on two different time scales:
- Short-term responses to implement during drought, such as voluntary water conservation guidelines, a hotline, streamlined administrative procedures for evaluating emergency assistance applications, and pre-produced infomercials leading agricultural producers and citizens to information on best management practices.

- Long-term drought mitigation projects, such as education programs to give various audiences the background they need to interpret drought news reports or scientific drought indices; programs to persuade people to adopt measures that enhance organic content in soil, conserve water, and otherwise boost the resilience of natural and social systems that are vulnerable to drought.

Assuming there is no ongoing drought, it's a good idea to publicize the recommendations of the task force and seek public input before the plan is implemented, particularly if anything seems revolutionary or controversial.

- Inventory all forms of assistance available from local, provincial and national government during severe drought.
- Work with the monitoring and risk assessment committees to establish triggers. The monitoring committee can advise the task force on which drought and water supply indices are most relevant for the province or region.
- Establish drought management areas. These subdivisions may be useful in drought management since they may allow drought stages and mitigation and response options to be regionalized. Climatic divisions are the most commonly used subdivisions at the provincial level, but they may not be the most appropriate, given topographic features, land use patterns, or water use characteristics.
- The drought task force should disseminate drought monitoring information and for letting the public know about the drought plan.

Monitoring Committee

A reliable assessment of water availability and its outlook for the near- and long-term is valuable information in both dry and wet periods. During drought, the value of this information increases markedly. The monitoring committee should include representatives from agencies with responsibilities for monitoring climate and water supply. It is recommended that data and information on each of the applicable indicators (e.g., precipitation, temperature, evapo-transpiration, long-range weather forecasts, soil moisture, stream-flow, ground water levels, reservoir and lake levels, and snow-pack) be considered in the committee's evaluation of the water situation and outlook for the province.

The monitoring committee should meet regularly, especially in advance of the peak demand season. Following each meeting, reports should be prepared and disseminated to the province's drought task force, relevant provincial and national agencies, and the media. It is essential for the public to receive a balanced interpretation of changing conditions. The monitoring committee should work closely with public information specialists to keep the public well informed.

Publicize the Proposed Plan, Solicit Reaction

- How the drought plan is expected to relieve impacts of drought. Stories can focus on the human dimensions of drought, such as how it affects a farm family; on its environmental consequences, such as reduced wildlife habitat; and on its economic effects, such as the costs to a particular industry or to the province's overall economy.

- What it will cost to implement each option, and how it will be funded.
- What changes people might be asked to make in response to different degrees of drought, such as restricted lawn watering and car washing, or not irrigating certain crops at certain times.

Implement The Plan

Once the task force and any external constituencies have agreed on the plan, the task force and/or its designated representatives should oversee implementation of both the short-term operational aspects of the plan and long-term mitigation measures. Periodic testing, evaluation, and updating of the drought plan will help keep the plan responsive to the needs. Long-term mitigation measures, such as implementing policies that require conjunctive use of ground and surface water, may require drafting new legislation and finding funds to support new monitoring and regulation efforts. In any case, it is essential to recognize that reducing long-term vulnerability to drought will require a sustained effort, although it may be a matter of long-term programs undertaken by a variety of agencies.

Develop Education Programs

A broad-based education program to raise awareness of short- and long-term water supply issues will help ensure that people know how to respond to drought when it occurs and that drought planning does not lose ground during non-drought years. It would be useful to tailor information to the needs of specific groups (e.g. elementary and secondary education, small business, industry, homeowners and utilities).

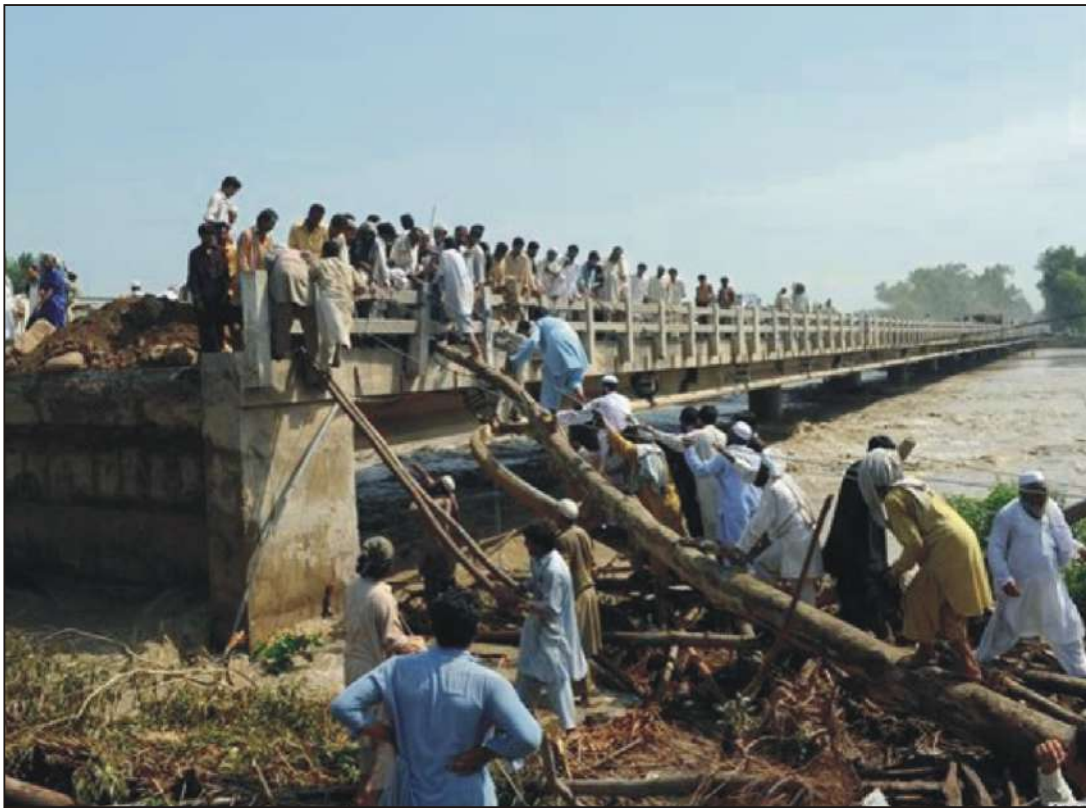
Post-drought Evaluation

A post-drought evaluation documents and analyzes the assessment and response actions of government, non-governmental organizations, and others. It provides for a mechanism to implement recommendations for improving the system. Without post-drought evaluations, it is difficult to learn from past successes and mistakes, because institutional memory fades.

Session M.3.3:**Flood Hazard Risk Management****1. Introduction**

It can be anticipated that risks of loss of lives and livelihoods associated with floods can be reduced significantly in situations where the people at risk are aware of the dangers; long warnings can be transmitted directly to those at risk; evacuation to safe areas within a reasonable distance is possible; property insurance is available and affordable; and the civil administrations and infrastructure remain intact. Conversely, risks increase when these conditions are not present.

Fig. 3.1: Some part of the bridge near Charsadda at River Swat has been broken during August 2010 flooding



Source: www.pakistanfloods.pk, (NDMA) Islamabad 2010

Fig. 3.2: Flood devastation during August 2010 flooding



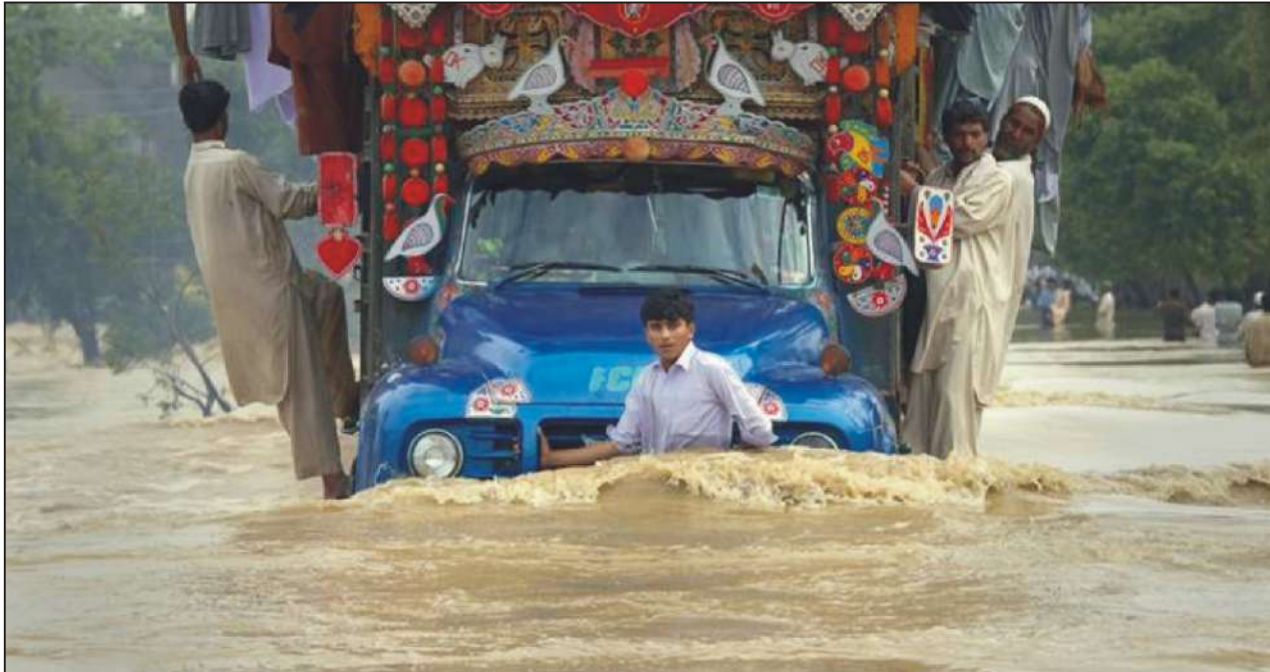
Source: www.pakistanfloods.pk, (NDMA) Islamabad 2010

Fig. 3.3: Flood affectees taking shelter at house roof during August 2010 flooding



Source: www.pakistanfloods.pk, (NDMA) Islamabad 2010

Fig. 3.4. Flood affectees are evacuating during August 2010 flooding



Source: www.pakistanfloods.pk, (NDMA) Islamabad 2010

2. Early warning systems

Flood warning systems operate at three levels. Meteorological warnings provide the longest warning but least accuracy. Once the rain has fallen, hydrological rainfall-runoff models will provide more accurate warnings but shorter warning periods. Flood routing methods based on upstream flow measurements will provide the most accurate predictions, but the warning periods will be shorter.

These methods and high level of technology is not available in other countries, where vulnerability to floods continue to increase.

- The role of government is to provide one official voice in the preparation of early warnings which must be understandable and credible.
- The probability of detection of severe meteorological events is increasing and the false alarm ratio is decreasing.
- Reaching the vulnerable is not easy.
- Early warning without response is meaningless.

Meteorological forecasts

Where available, satellite and radar imagery are very useful for determining where heavy rainfall has occurred. They also provide accurate information where rain has not occurred. This is important information in the case of widespread flooding.

Impediments to the development of meteorological forecasting are the lack of capacity to apply the necessary technology. National forecasting services are poorly equipped and often lack the required technical skills. Even where this capacity is available, institutions from outside the country's borders frequently issue warnings before the national agencies are in a position to do so. National agencies lose credibility because they are less well equipped, and consequently take longer to issue the warnings. They are also at a disadvantage because they have to be conservative when issuing warnings. In these situations, the ideal is a co-operative venture between the national and the external meteorological agencies. This has not yet occurred.

Another difficulty is that the communities at risk are scattered over wide areas and do not have access to telephones or radio communications. These result in frustrations and comments questioning the value of early warning systems when people do not react to them.

Warnings based on flood routing procedures

Warnings based on flood routing procedures are only feasible on large rivers with long travel times measured in days. However, in these rivers the water levels rise slowly and floods seldom result in loss of life or livelihoods. These warnings are nevertheless useful for implementing planned evacuation procedures.

Antecedent precipitation indices

Antecedent precipitation indices are an under-utilized basis for flood warning systems, particularly in moderate to low rainfall regions. In these regions the average soil moisture content prior to the occurrence of a flood is generally low. As a result storm rainfall has to satisfy the soil moisture deficit before appreciable runoff occurs. They also provide a good indication of the amount of additional rainfall required to generate floods. Appropriate action can be taken as soon as additional rainfall is observed.

3. Structural measures

Many developing countries do not have the financial resources to implement structural flood control measures. Large multi-purpose dams with uncontrolled spillways will reduce flood peaks to some extent, but this will generally decrease with increase in flood magnitude. Dams with controlled spillways will have a larger flood peak reduction potential, but can have the opposite effect if incorrectly operated.

Dam failures can have a very large damage potential, but modern dam safety requirements have significantly reduced this likelihood to close to zero in the case of potential 'dry weather' failures. Occasional dam failures during floods usually occur when the flood water levels are already high downstream. The incremental flood magnitude, and increases in water level and water velocity downstream are usually quite small, particularly in the case of breached earth fill dams.

Fig. 3.5 and 3.6: Flood mitigation measures (Structural adjustment)



Source: NDMA Islamabad, 2009



Source: http://www.treehugger.com/tarbela_dam_outfall_pakistan.jpg

4. An invitation to disaster

There are tens of thousands of people living in unplanned, flood prone settlements in urban areas. In many urban areas in developing countries there are thousands of people living along the banks of rivers below this flood-line. Shacks are often built on all available space right up to the edge of the almost vertical river banks. In some cases shacks are built on refuse dumps within the channel itself. Even minor floods that do not overtop the river banks could engulf the shacks within the river channel, and undermine the river banks causing the shacks on the banks to collapse into the river.

Once the flood water level rises above the river banks the flimsy, densely packed shacks further from the river will start collapsing. The debris from the shacks, particularly floating timber and submerged corrugated iron sheets caught in the fast flowing water will seriously injure escapees attempting to wade through the water even if this is less than knee-deep.

A lot of floating debris will be carried by floods, including uprooted trees from the upstream catchment, and material from destroyed houses and their contents. This debris will hinder rescue attempts and increase the probability that people washed into the river will drown. Debris may also block bridge openings and deflect the flood to another area that would otherwise have been out of danger. Lives may be lost when spectators gather on bridges or on the river banks and their escape routes are cut off as the river rises, or the river banks collapse. It will be impossible to use rubber boats on the river to rescue people trapped in the debris. A major flood will rise rapidly, destroy all shacks in its path and result in a large loss of life.

Options for reducing the flood risk in unplanned settlements

The 'do nothing' option is obviously unacceptable in this situation. Structural flood risk reduction measures are not a viable option as there are seldom suitable upstream dam sites, and there is no unoccupied space on the river banks for the erection of flood levees. Canalization of the river channel will not reduce flood levels. The relocation of families living within flood prone areas to safer areas is long term solution. This can be achieved by the provision of new houses in safe areas for those most at risk. However, there are difficult political decisions that have to be taken before this objective can be achieved.

Those most at risk are usually those who arrived last by which time no other land was available. They therefore have the lowest priority for new houses. If they are given high priority, this policy will become known and will encourage others to deliberately occupy unsafe areas.

Areas that have been evacuated may subsequently be re-occupied if the local authority does not have powers to prevent this happening. Alternatively occupants of shacks in unsafe areas may prefer to stay where they are rather than to move to better housing further from their places of employment, schools, and other facilities. This leaves the implementation of a flood warning system as the only viable short term solution.

River watch systems

A simple community based river watch system should be instituted in all unplanned settlements vulnerable to floods. This could consist of a watchman on the river bank, and previously identified gathering areas to which the affected families could retreat when floods occur. In the short term, often the only viable options to reduce the loss of life in 'vulnerable informal settlements in developing countries are simple and

inexpensive river watch systems coupled with awareness programs. These can be upgraded to more sophisticated flood warning systems as finances permit.

Flood warning systems

Automatic rainfall telemetry equipment can be installed at one or more sites upstream of the area. Water level information can be relayed to an operations centre and sirens within the settlements can be activated by radio from the operations centre when the water level in the river reaches a level that is likely to pose a risk in the settlement area. The advance warning may be very short-possibly less than 30 minutes so it is imperative that the communities at risk should know what to do when the sirens are sounded. The final solution is to provide incentives that will encourage the threatened communities to move to less vulnerable areas. In many cases this will be a long process as housing will have to be provided at a faster rate than the influx of socially and economically disadvantaged people into the high risk areas. There are many communities in the world in similar situations.

5. Flood risk reduction in informal settlements

Complete success of flood risk reduction measures in informal settlements within urban areas is unlikely to be achieved because of the very high exposure to flood risks, as well as limitations of manpower and other resources available to deal with the resulting emergencies. An unpalatable fact is that after a flood the failures, such as loss of life, can easily be measured, but successes cannot. The ideal solution in an urban area would be to design and build all drainage systems to provide a high degree of safety, and to prohibit residential occupation or other activity in areas where risks cannot be avoided. This solution is not economically feasible as far as the structures are concerned and socio-politically intractable as far as the unplanned occupation of flood plains is concerned.

There are five options available for reducing the risk of loss of life and possessions of people living in flood prone unplanned settlement areas. The following comments summarize the advantages and disadvantages of each option; the information required for decision making; and the technology required for its implementation.

Option 1 - Do nothing: The option to do nothing and let nature take its course is the default option. There are many reports from developed as well as developing countries which cite the lack of political will to take unpopular decisions which incur additional costs that produce no visible benefits. The advantages are minimal cost and (assumed) avoidance of the legal consequences of direct action on the basis that residents in flood prone areas are there at their own risk. The disadvantages are the possible loss of life and possessions with resultant humanitarian, social and political consequences.

Option 2 - Apply measures to control occupation in flood prone areas: The prohibition of residential occupation below designated flood-lines and the imposition of building codes within flood-prone areas are standard practices in many local authorities throughout the world. These are the most effective options for reducing flood-related risks in urban areas. However, these measures have become unenforceable in many developing countries where there has been uncontrollable migration from rural to urban areas. There are many reasons for this migration - most of them poverty related. The obvious solution is to encourage occupants in the danger areas to move to safer areas, but this is often impractical in the short term. The main disadvantage is that the danger areas may be re-occupied by others. Information required for decision

making is whether or not alternative ground is available. Will the people go there? Can re-occupation by others be prevented? What are the costs of preparing the new area? What are the relocation costs?

Option 3 - Structural measures: The purpose of structural measures is to reduce flood peaks (*flood control dams*), or protect areas from inundation (*flood levees*), or reduce flood levels (*canalization*). The advantages of structural measures are that they can provide effective protection against minor floods. The disadvantages are the high cost and false sense of security as it is always possible that a flood exceeding the design flood may occur. In general, the larger the flood, the less effective the structural flood protection measure is likely to be. The information required for decision making is mainly the availability of suitable sites and finance. The technology required for implementation is an advanced knowledge of flood hydrology, river hydraulics and structural design.

Option 4 - Develop flood warning systems: The operation of flood warning systems is the most efficient method for reducing the risk of loss of life where the unplanned occupation of flood prone areas has taken place, and legislation prohibiting residential occupation in these areas has not been enforced. There are several important pre-conditions for any flood warning system. All people within the flood prone areas must routinely be made aware of the danger so that they will react immediately when warnings are issued. It must be physically possible to relay warnings timorously to all people at risk. A continuously manned operations centre must be available so that trained staff can receive and interpret weather and flood related information and take appropriate action should flood situations develop. The technology required for implementation includes a high degree of computer-based communications technology together with a sound knowledge of flood hydrology and river hydraulics. The disadvantages of flood warning systems are that even where efficient systems are in operation, there will be occasions when flood warnings are issued and no damaging floods occur, or conversely damaging floods may occur without warnings being issued. These could result in loss of confidence in the flood warning system and possible claims for compensation. An ineffective flood warning system is worse than no system at all. The information required for decision making includes the availability of a manned operations facility, technical expertise and financing. An adequate knowledge of flood hydrology and river hydraulics is required for the location of designated flood-lines. Questions that have to be addressed include: can residents be warned in time, and will residents have confidence in the warnings and in the authority that issues them?

Option 5 - Develop community river watch systems: There are many situations within and outside the jurisdiction of local authorities where efficient flood warning systems are impractical for financial or logistical reasons. In these situations the only feasible solution is to provide facilities and knowledge to local communities so that they can operate their own river watch systems.

The purpose of a river watch system is to make residents within flood prone areas aware of the danger so that they can take appropriate 'action should floods occur. They will have to familiarize themselves with the location of safe escape routes, and gathering places where they can temporarily keep their possessions until the river subsides. The flood awareness program could include the dissemination of regular newsletters, marking previous flood levels on beacons, posts, telephone poles, bridges, etc, or including floodlines on title deed plans. The advantages of a river watch system are that it is an efficient system in small communities, and requires minimum installation and operation costs. The disadvantages are that it is only effective where residents are literate and have an appreciation of flood risks. Residents have no means of obtaining prior warnings of heavy rainfall within the catchment or upstream river flow. Communities usually have no experience of floods and consequently the need for a river watch system. Communities may lose interest

Session M.3.4:**Disaster Risk Management and Livelihoods**

- Livelihoods are a key area in strengthening people's capacity to cope with Disasters.
- Livelihoods are built on five types of resources, which includes human resources, social resources, natural resources, physical resources and financial resources;
- Disasters can disrupt the social mechanisms of livelihoods including production, exchanges, endowment, entitlement, claims and access.
- Livelihoods strategies and activities are also influenced by the location, since the nature of building blocks or resources is determined by their geographical location e.g. mountainous regions / upland areas, low-land areas / plains and coastal areas.
- The resources of people are determined by the structures and processes operating in a society, which provides or deny access to resources on the basis of people's class, caste, gender, education, religion or ethnicity.
- Development agencies and governments can provide direct and indirect support for strengthening people's resources to increase their choices and opportunities for better livelihood options.
- Livelihood activities of the poor largely remain invisible. That is why the official disaster assessment reports do not incorporate them in case of losses due to any natural or man-made disaster.

- It is assumed that the rich people are better able to avoid disasters and to recover from losses and damages, if they are hit by disasters. Their losses although may be more in absolute terms, but they suffer less damages in relative terms in comparison to the poor. Thus in order to enhance poor people's capacity to cope with disasters, it is imperative to strengthen their livelihoods. A change in the structures and processes that shape people's livelihoods are essential for providing people with better livelihood options.
- Various studies on disasters and livelihoods have observed that families with more material and social resources often recover quickly from disaster affects as compared to those having less or minimum means of living.
- A livelihood is sustainable when it has the potential to cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets for the time being and in future.
- Livelihood options are the set of opportunities, choices, strategies and activities that are available to individuals and families from which they can select their means of living.
- Reduced vulnerability, more income generating opportunities, increased well-being, improved food

security and a sustainable use of natural resource base are essential components to achieve positive livelihood outcomes.

Types of Resources: As pointed out in the key concepts, there are five core resource categories upon which livelihoods are built. These include following:

- ***Human Resources:*** Human resources are building blocks or means to achieve livelihood outcomes. However, accumulation of human resources can also be an end in itself. Many people regard deteriorating health conditions and lack of education as core dimensions of poverty. Diverse human capital enables at-risk communities to devise different livelihood strategies in order to cope with natural or man-made hazards and to achieve livelihood outcomes. Human capital is important because it makes people capable of using other four types of resources effectively for positive livelihood outcomes.

- ***Social Resources:*** These resources are developed through:
 - Horizontal or vertical networks of people that increases mutual trust with a spirit of working together for having access to institutional circles and structures such as political or civic bodies;
 - Formal membership of community based organizations / associations etc.

Social resources can help increase people's income and rates of saving by improving the efficiency of economic relations on the basis of mutual trust and working together. Networks facilitate innovations, and knowledge development and sharing. This reflects the state of close relationship between social and human resources.

- ***Natural Resources:*** Natural resource base refers to the natural stocks that generate resources and useful services for livelihoods. Services that can be derived from natural resources include;
 - Land
 - Forests
 - Marine / wild resources
 - Water
 - Air quality
 - Erosion protection
 - Waste assimilation
 - Storm protection
 - Bio-diversity

Natural resources and disasters are closely associated with each other. Natural disasters such as cyclones, earthquakes etc. are the outcomes of natural processes that destroy natural resources and devastate people's livelihoods.

The vulnerable and resource-poor people largely derive their means of livelihoods from the natural resource base (*farming, fishing, mineral extraction etc.*). That is why their survival remains at risk without the protection and conservation of natural resources. For example, health will deteriorate where air quality is poor as a result of polluted industrial activities or natural disasters. People's health and well being depend upon the continued functioning of complex ecosystems.

- ***Physical Resources:*** Physical resources are a fundamental need to support livelihoods. Lack of particular types of infrastructure can be core dimension of poverty. The opportunity costs associated with poor infrastructure can preclude education, access to health services and income generation. For example, farmers will have difficulty in bringing their agriculture produce to the market if they are not provided with road infrastructure.

Following components of infrastructure are believed to be essential for sustainable livelihoods;

- Affordable transport
- Adequate shelters and safe buildings
- Adequate water supply and sanitation
- Affordable energy
- Access to information

- ***Financial Resources:*** To achieve sustainable livelihoods objectives, following are the major sources of financial resources:

- Savings are the preferred type of financial resources since they do not have liabilities attached and usually do not entail reliance on others. Such forms include cash, bank deposits or liquid assets (livestock and jewelry etc.)
- Reliable mechanisms of pensions, remittances, and / or other transfers from the state are some common inflows that positively contribute to financial resources.

Session M.3.5:

Public Awareness in Disaster Risk Management

Public awareness is not a once and for all thing. It is something that has to be repeated at regular intervals.

Because

- *People forget if an event does not affect them particularly for some years.*
- *People change, new people come into a Community.*
- *People die (taking away community memories), young people grow up.*

The next disaster occurs when the earlier disaster is forgotten

Source: ADPC Thailand 2005

- Public awareness as a disaster reduction measure aims to increase the community's knowledge about disaster risks and practical preparedness and mitigation measures, including waning signals.
- Essential features of an effective public awareness program are the following: ongoing and sustained process; active community participation from design to implementation; hazard- and community-specific; integrated in the local warning and response system.

1. What is Public Awareness?

- The process by which vulnerable populations understand the nature of hazards and their potential for causing disasters (ADPC)
- A systematic distribution of information about potential hazards and threats and that people can do about them, in order to encourage people to act to protect their lives and property. (CDRC)
- The process through which people living in hazard-prone areas come to realize and understand that they live in areas of risks, know the specific dangers that they are exposed to and the warnings that are issued, and know the appropriate actions to be taken to protect their live and minimize property damage. (ADPC)
- Education successfully communicated to the public. (CDRC)

Fig. 3.7: Disaster Management Committee member explaining the search and rescue action plan



Source: National Institute of Disaster Management (NIDM) Islamabad 2010

2. Objectives of public awareness

- To increase the public knowledge about hazards, their nature and the possible consequences of their impact
- To increase knowledge about practical preparedness measures
- To inform the public about the warning system that will be employed and what they should do when they receive it
- To increase knowledge on how to respond to an emergency situation
- To mobilize support for disaster risk reduction plans or response activities

3. Elements of Public Awareness

a. Purpose

- Message
- Means
- Audience
- Intended result

Fig. 3.8: Demonstration on medical first aid during a training course on Disaster Risk Management



Source: National Institute of Disaster Management (NIDM) Islamabad 2010

b. Structure

- Has long term and repetitive approach
- Is consistent
- Utilizes a wide variety of methods and media

4. Key Features of Public Awareness

- *On-going Process* - Public awareness is an on-going process, not simply a set of products such as posters, brochures, etc.
- *Participatory* - Target population are active participants in program design and implementation phases, in partnership with individuals having the necessary technical skills.
- *Community Specific* - An assessment of specific hazards is the essential basis for developing public awareness programs.
- *Target Population Specific* - Must be based on need of specific user groups for information, which are essential to them (*women, children, and indigenous people*).
- Integral Part of Local Warning and Response System

5. Steps in Setting-up a Public Awareness Program

a. Establish the need

- What do people know about the hazards they are prone to?
- What do they do to prepare for such hazards? Are these adequate?
- Do people understand the meaning of warnings and what they should do when they hear these?

b. Planning the Program

- Define without bias how people will behave before the hazard impact, during the impact and after the impact.
- Define the critical elements of the program.
- Who should be informed? Who are the most vulnerable? What are their habits, preferences,
- what is the common means through which they get information?
- What type of hazard, potential effects?
- Who will be involved in the implementation?
- How can it promote self-reliance and uphold sound indigenous practices?
- How can results be sustained?

c. Resource Mobilization

- List down resources needed and sources

d. Implementation

e. Evaluation

f. Improvement of the program

6. Critical factors for Effective Communication

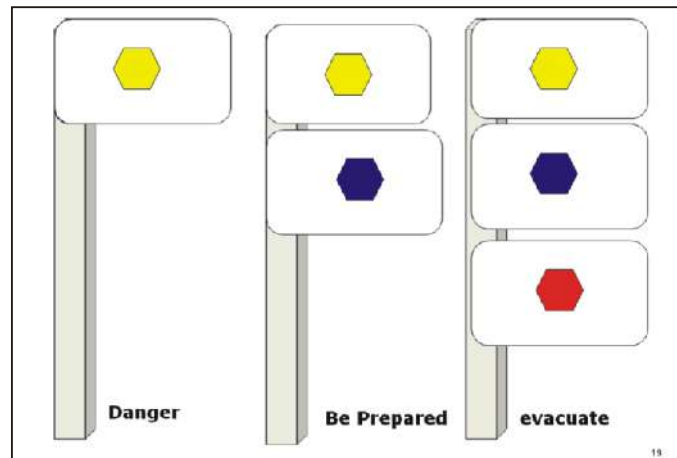
Credibility -The recipient must have confidence in the source and this may involve building a climate of trust between the sender and receiver

- *Context* - Must form part of the normal environment of the receiver to enable them to relate to the information. Make the materials as locally specific as possible. People are more likely to take action if they come to understand that they are personally at risk.
- *Content* - Must have meaning for the receiver; it must be compatible with his value system and relevant to the problem. Relate the facts about hazards to human experience rather than solely relying on statistics. Suggest specific actions that can be taken to reduce losses and highlight the benefit of such actions.
- *Clarity* - Must be in simple terms; the further it travels, the simpler it should be. Keep the material simple to ensure that essential facts are easily understood
- *Continuity and Consistency* - Message should be repeated and should be consistent with one another. Repeat the reinforced message in a continuing rather than in a single awareness effort. Use various means of conveying the same message to sustain interest.
- *Channels* - Established channels of communication should be utilized particularly channels that are used and respected by the audience.
- *Capability* - Must take into account such factors as the receiver's habit, degree of literacy and knowledge of the world. Make certain that materials are in a language, which target audience understands.
- *Creativity* - Must be in form that will take interest of audience. Use pictures or graphic descriptions or earlier losses or people's action, which save them.

7. What the Community/Organizations can do to promote Public Awareness

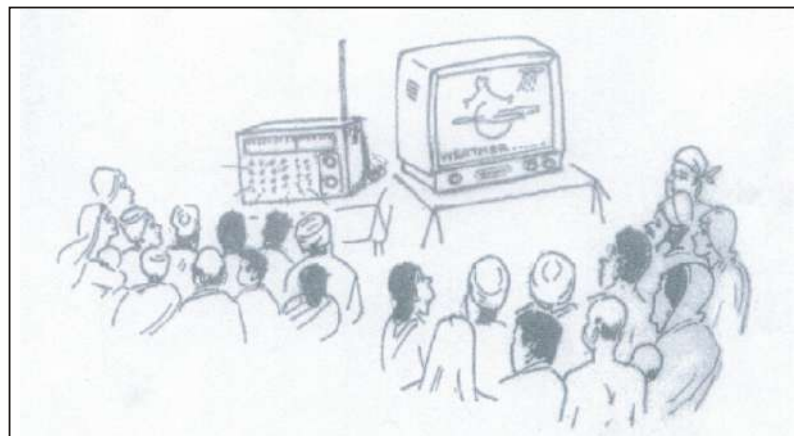
- Community Meetings
- Community discussion groups
- Wall sheets, posters, newsletters
- Plays
- Leaflets, manuals, handbooks, brochures, books, comics
- Forum
- Press releases national or local newspaper, radio or television
- Transparencies, slide presentations, film, photos for exhibit
- Public speeches, letters to the editors, articles in the printed media
- Radio programs, etc...

Fig 3.9: Flood level warning Signs for public awareness



Source: PRCS Karachi 2010

Fig. 3.10: Listen to Radio and watch Television regularly to get up-to-date information about the potential threat



Source: PRCS Karachi 2010

Fig. 3.11: Women observing Disaster Prevention Day



Source: Doaba Foundation and Oxfam GB, 2009

Session M.3.6:**Community Based Disaster Risk Management**

“Preventive measures are most effective when they involve participation at all levels, from the local community through the national government to the regional and international level.”

(IDNDR Conference Papers, Japan, 1994).

1. Concept

Disaster risk management includes community based-disaster risk management in which at-risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks. This means that at-risk communities are at the heart of decision-making and implementation of disaster risk management activities in order to reduce their vulnerabilities and enhance their capacities. It is essential that the capacity of the community be built so that they are able to assess the risk, identify risk reduction measures and plan and implement these risk reduction measures. Risk reduction measures include those activities that will prevent disasters, mitigate hazards, and prepare the community to respond to crisis and emergencies.

The involvement of the most vulnerable is paramount and the support of the least vulnerable is necessary. In CBDRM, local and national governments are involved and supportive.

2. Aims of CBDRMDisaster Risk Reduction

Achieve resilient communities and effective risk reduction, through the inclusion of a community based approach in government disaster risk management policy and strategy and through gender equality.

Sustainable Development and Poverty Reduction

Contribute to sustainable development and poverty reduction through development-oriented risk management strategies, achieved through strengthening community coping capacities.

People empowerment

Empower at-risk communities to deal with disaster risks by themselves, through building capacities of the most vulnerable and making the outside stakeholders accountable to the community.

Equity

Achieve equity in development gains through transforming community relations and structures.

3. Contribution of CBDRM to Sustainable Development and UN-Millennium Development Goals

Sustainable development was defined as, “meeting the needs of the present generations without compromising the ability of future generations to meet their needs” (Brundtland Commission). There are four essential aspects of sustainability: Social, Environmental, Economic and Institutional. Please refer to

the table 1 to see the United Nations Millennium Development Goals (*MDGs*)

Community based disaster risk management is envisaged as an integral component of sustainable development, since it helps in avoiding the negative impacts of disasters on development. CBDRM can contribute to good sustainable development by:

- Reducing disaster impact to lives, assets and livelihoods through addressing hazards and building people's capability to continually pursue development goals. (*MDG 7*)
- Through promoting protection and rehabilitation of environmental resources, as an important mitigation strategy (*MDG 7*)
- Strengthening livelihood assets at household and community level, through sustained institutions and resource flows (*MDG 1*)
- Strengthening social capital, networks and organizations of people, and their interaction with the state and its services (*MDG 8*)
- Focusing state efforts on the most vulnerable and poor to address social inequalities, including inter-generational inequalities
- Protecting physical assets and infrastructure
- Utilizing financial resources effectively and efficiently
- Reducing poverty as a strategy to reduce vulnerability (*MDG 1*)
- Reducing mortality through building disaster resilient communities (*MDG 4*)
- Contributing to better sanitation, education, nutrition and food security (*MDG 2 & 5*).
- Promoting gender equality through building capacities of women and reducing their specific vulnerabilities to disaster risks (*MDG 3*).

Table 3.3: UN - Millennium Development Goals

Goal 1	Eradicate Extreme Poverty and hunger
Goal 2	Achieve universal primary education
Goal 3	Promote gender equality and empower women
Goal 4	Reduce child mortality
Goal 5	Improve maternal health
Goal 6	Combat HIV/AIDS, malaria and other diseases
Goal 7	Ensure environmental sustainability
Goal 8	Develop a global partnership for development

Fig. 3.12: MOC exercise at cyclone hit community at Thatta District

Source: NDMA Islamabad, 2010

4. Key characteristics

a) Philosophy

- CBDRM contributes to addressing the *root causes of vulnerabilities* and to transforming or removing the structures generating inequity and underdevelopment.
- CBDRM is a *development-oriented approach*. The long-term goal of CBDRM is to promote sustainable development and this can be only achieved through integrating CBDRM in to the development practice in all sectors. It works best when it is integrated with structural and non-structural development planning.
- Living in disaster safe communities is considered a basic human right.
- Community knowledge, culture and customs are recognized and respected.

Fig. 3.13: Community meeting with the stakeholders at Hyderabad

Source: NDMA Islamabad, 2010

b) Actors

- CBDRM recognize the *central role of vulnerable groups and persons*. It means that people are given the opportunity to identify disaster risks, find solutions and make choices to build their own safer future. Therefore, a “bottom up” approach is considered as an essential part of disaster risk management.
- CBDRM is gender sensitive. It recognizes that men and women have different needs, different activities and different perception of risk and different priorities. *Women's participation as disaster managers* at all levels is integrated.
- There is a *wide range of actors* in CBDRM. It recognizes that since community based initiatives will usually require resources from outside the community, there is a need for broad, interdisciplinary, local to national and national to local interaction. The role of NGOs, government and civil society (faith groups, business, academe, and other professionals) is supportive.
- The role of media as an important stakeholder is recognized.

Fig. 3.14. Community meeting at cyclone hit community in Thatta District



Source: NDMA Islamabad, 2010

c) *Nature of Stakeholder Relationships*

- CBDRM requires a high level of *coordination and cooperation* amongst stakeholders, e.g. governments, donors, NGO's and vulnerable groups and people.
- CBDRM advocates and workers believe that they are *accountable to the people* first and foremost.
- There is a need to maintain *efforts to enhance inclusiveness*, decentralization and empowerment

d) *Approach to Implementation*

- It puts a premium on the *organizational capacity of the vulnerable sectors* through the formation of grassroots disaster risk management organizations;
- The *strategies of CBDRM are participatory in nature*. These include participatory analysis, hazard mapping, vulnerability and capacity assessment, counter disaster planning, implementation and monitoring and evaluation.
- *CBDRM is multi-faceted and highly adaptable*. It is most effective when it is contextualized and adapted to match the social, political and cultural environment in specific locations at a specific point in time

- It recognizes the need for *continued innovation*. The risk management related needs of communities in different cultural contexts and over time may change. Therefore, new strategies will always need to be invented to meet those needs.
- It provides an opportunity to *share resources* from different stakeholders and complement the limited resources of the governments
- CBDRM contributes to *empowerment of community members, and can bring pride, dignity, self-confidence*, a desire to learn more and a willingness to seek improvements.

Fig. 3.15. Community meeting in Jati village at Thatta District



Source: National Institute of Disaster Management (NIDM) Islamabad, 2010

5. Monitoring and Evaluation in CBDRM

a) Definitions

Monitoring was defined as the continuous and periodic review and overseeing by all stakeholders managing an activity, to ensure that input deliveries, work schedules, target outputs, and other requirements are proceeding according to plan. Monitoring has two types.

- Process monitoring
- Effect Monitoring

Monitoring is done at various levels

- Community or field level
- Regional/district or local level
- Provincial level
- National/headquarter Level

Evaluation is an activity whereby the results and effects of a project are being assessed, to see to what extent the project objectives have been achieved. After a project has finished, an evaluation helps to find out whether the project has been successful or not. Evaluation can be done as an internal review or as an external impact assessment. Evaluation is done on the following aspects.

- Impact on the beneficiaries
- Appropriateness regarding needs, duration/timing, customs and practice
- Efficiency and cost effectiveness
- Coverage: geographical, targeted vulnerable groups
- Sustainability
- Replicability of the activity
- Coherence
- Gender

b) *Utilizing the Results*

- Integration into planning procedures for future interventions
- Feedback and discussion for learning and growth
- Give feedback to other partners, government institutions
- Identify areas for improvement, to redefine project priorities and actions for next activity

c) *Notes on Current Status in the Region*

- Community is often involved in implementation, but not in monitoring and evaluation;
- Although baseline surveys are conducted at the project start up but impact indicators are not developed;
- Various organizations follow very different approaches on monitoring and evaluation;
- There is no common framework, guidelines and standards available on participatory monitoring and evaluation;
- It is not possible to develop common impact indicators for CBDRM monitoring and evaluation since situation in different communities varies;
- Current monitoring and evaluation practice focus more on assessing quantity rather than quality;
- Few NGOs are implementing participatory monitoring and evaluation;
- In the case of community based organizations, monitoring and evaluation is a built-in process, and it is not done explicitly.

d) *Current Approaches and Methods*

- Logical Framework Matrix/ observing the key result areas

- Strengths, weaknesses, opportunities and threats analysis (SWOT)
- External Evaluation
- Preliminary social investigations and analysis
- Field monitoring visits
- Participatory Rural Appraisal
- Family clustering
- Regular community meeting
- Case Story writing
- Periodic reviews
- Capacities and vulnerabilities analysis
- Regular record keeping
- Formal questionnaire survey
- Informal conversations
- Lesson learnt workshops

e) *Process in Participatory M & E*

People's participation is a must, as it enhances the integration and recognition of community knowledge and experiences, and ensures accurate and reliable data. Participatory approach makes sure that the project beneficiaries carry out monitoring and evaluation. The information gathered is aimed at helping people analyze and interpret their own progress, and to help identify and anticipate problems and to plan their own steps to avoid or solve these problems. In the participatory monitoring system, information flows between all the people involved: the community, the government, donors, NGOs.

- Form a Program Coordination Team of all stakeholders (including beneficiaries, implementing organization/s, government, donors and others) to develop, implement, monitor and evaluate the program activities.
- Develop impact indicators to meet the requirements of all stakeholders
- Define roles and responsibilities of all stakeholders in M & E
- Jointly conduct data-collection, analysis and review of agreed impact indicators, achievements and activities implemented
- Present the findings and analysis of M & E process to partners from various levels for validation
- Finalize the evaluation report and disseminate to partners

6. Participatory Monitoring and Evaluation Approach Enhance:

- Joint responsibility
- Capacity of partners in program management
- Accountability to partners and to beneficiaries
- Ownership amongst partners and beneficiaries
- Learning and reflection
- Attitudinal change
- Customization of program strategies to local conditions

f) *Strategies to Promote Participatory M & E*

- Develop M & E framework for CBDRM, based on country context
- Develop general areas of impact indicators, performance indicators and qualitative indicators
- Raise awareness on the need for participatory monitoring & evaluation
- Build capacity of government, community and other actors on P M & E
- Build Monitoring and Evaluation into initial planning process
- Form multi-stakeholder program management teams to implement P M & E
- Conduct baseline survey before the project start and develop community specific impact indicators with the participation of beneficiaries
- Acclimatize monitoring and evaluation scheme with the community socio-economic calendars to encourage more participation
- Develop writing and note taking skills of community members and instill the habit and discipline of record keeping
- Integrate properly in local government's planning on community sustainable development strategy
- Design an effective feedback and review mechanism
- Ensure social, organizational and institutional learning
- Analyze why people do not participate, and how their behavior and attitudes could be changed to encourage participation.

g) *Examples of Indicators*

Impact indicators

- Reduce number of casualties
- Improve the quality of life (agriculture, health, resiliency)
- Ensure Safer communities
- Strengthen livelihoods security

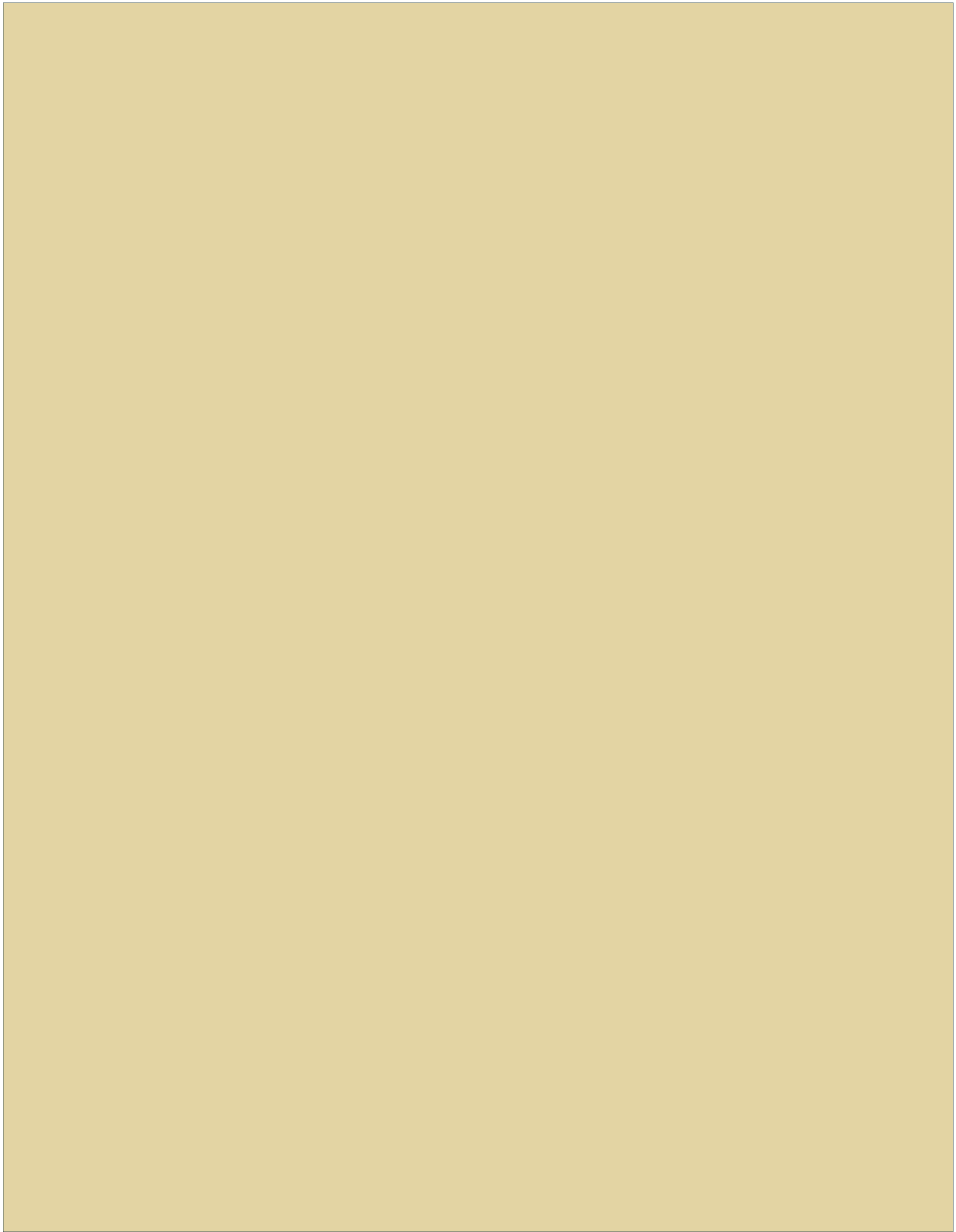
Process

- Ensure 'real' participation
- Enable community focused leadership
- Focus on strengthening community linkages (Break down dividers)
Proactive focus on risk reduction

Module 4:

Disaster Risk Management Planning





Session M.4.1:

Overview of Preparedness Planning

1. The Nature of Preparedness

Preparedness is inter-related with many other aspects of disaster risk management. In fact, it can almost be said that every aspect of disaster risk management affects, or is affected by, preparedness. There is, however, another significant factor which concerns preparedness. This is due to its different nature when compared with prevention/mitigation. Measures of prevention/mitigation tend to be geared towards major policy decisions at government level; they are also usually directed primarily from senior management levels. Preparedness measures, however, tend to be more strongly oriented towards action by individual organizations. The fact that, generally speaking, significant numbers of organizations are involved in preparedness emphasizes that there is a more critical requirement for coordination than may be the case with prevention/mitigation.

2. Preparedness Needs

The maintenance of effective disaster preparedness is a dynamic requirement. Left to itself, preparedness will quickly fade away, even to the point of becoming virtually non-existent. This chapter therefore presents a summary of many different aspects which affect preparedness.

National Disaster Risk Policy

There is need for a clear and comprehensive national disaster risk policy which covers all aspects of disaster risk management and which ensures that preparedness is given proper consideration and priority.

Disaster Risk Legislation

Special disaster legislation may be necessary to ensure that preparedness aspects of national policy are adequately covered and implemented. In some countries this has been found necessary, especially to ensure that preparedness measures exist in the private sector and/or within communities.

Organizational Structure

There also needs to be a clear and workable organizational structure, so that levels of disaster preparedness are identified. Disaster legislation helps to formalize this aspect. There is also need within the organizational structure for some form of national disaster risk management section or office.

National Disaster Risk Management Section (or Office)

In relation to preparedness, some form of national disaster risk management section or office is vitally important. There needs to be a continuous process of monitoring applied to the a range of necessary preparedness activities. This can be done most effectively by a specialist section.

Assessment of Preparedness Actions

Adequate arrangements for identifying, assessing and monitoring the disaster threat are also necessary. In turn, this enables a reasonable forecast to be made of the likely effects arising from disasters. Preparedness is vitally concerned with these effects, because they constitute the actual circumstances, events and problems against which preparations need to be made. Usually, these effects are many and varied. For

example, they include:

- casualties,
- damage to and destruction of property,
- damage to subsistence and cash crops,
- disruption of services,
- damage to national infrastructure,
- economic loss,
- loss of livelihood.

Therefore, preparedness measures to deal with these effects need to be determined and put in place before disaster strikes.

Planning Framework

If preparedness measures are to be fully effective, they need to be clearly set out in appropriate plans. Such plans usually need to apply at national, provincial/regional and local government and community levels. If preparedness measures are set within this planning framework, responsibilities for them can be clearly and officially defined. This also helps to ensure that the measures can be systematically monitored and kept up-to-date.

The production of effective counter-disaster plans usually involves considerable negotiation with resource organizations (e.g. government departments, non-government organizations), especially to ensure that their capability is utilized to the maximum extent. This is important because, especially in severe disaster circumstances, the total capability of these organizations is needed to deal with the many operational tasks which arise.

Utilization of Resources

If available resources are to be utilized to optimum effect, there must be:

- An accurate and up-to-date inventory of all available resource organizations (e.g. government departments, non-government organizations, potential international assistance agencies).
- Clear allocation of the roles and responsibilities which resource organizations are required to undertake during response operations and, where necessary, during the recovery phase.
- Suitable preparedness arrangements within resource organizations ensure that they are able to fulfill their roles when required. It is advisable that their preparedness arrangements should follow common guidelines and, advisedly, these guidelines should be issued by the national disaster management section as part of the general planning process.
- It is also desirable that the capability of resource organizations should be monitored, as appropriate, in order to ensure the operational roles can be fulfilled. This can usually be done by the organizations themselves but, if necessary, assistance can be provided from the national disaster risk management section.
- Consideration should also be given to preparedness measures necessary for the reception and utilization of international resource. These might include arrangements for reception, storage and distribution of

relief commodities; utilization of assistance teams (e.g. rescue workers, medical personnel, technical teams); fly-in and turn-round of assistance aircraft, including refueling and similar arrangements; port handling facilities for visiting sea transport.

Coordination of Effort

Disaster preparedness (and the response operations to which preparedness essentially applies) involves a wide range of activities and organizations. If these activities are to be successfully carried out by the organizations concerned, there clearly needs to be a system for achieving the coordinated effort.

This system is usually provided through the organizational framework. For instance, a provincial disaster committee would normally co-ordinate activities within its area of responsibility. However, additional coordinating responsibilities may be designated to organizations or individuals, if deemed necessary.

Arrangements to achieve successful co-ordination of effort must obviously be made, as a part of preparedness, before disaster impact.

Operational Facilities and Systems

Adequate preparedness of the various facilities and systems which are required for response operations is also most important. Such facilities and systems usually include:

- emergency or stand-by communications;
- a warning system, including provision of warning and information to the general public;
- a system for activating the organizational structure and its resource organizations (usually by designating stages such as Alert, Stand-by and Action);
- emergency operations centers (which form the focal points of information management);
- a system for damage survey and assessment of needs;
- emergency relief arrangements (for food, shelter materials, medical assistance)

Equipment and Supplies

If stockpiles of emergency equipment and supplies are held, these need appropriate surveillance to ensure their serviceability and ready availability. Emergency equipment needs to be held at the levels where it will be primarily used (e.g. equipment for local self-help teams, such as picks and shovels, needs to be held at community level). Sometimes safe storage (and thus ready availability) poses some problems. However, these can usually be overcome locally. In one case the village schoolmaster was made responsible for storing and maintaining emergency stocks and school children had a part in checking and accounting for them.

When there is a possibility that equipment and supplies from the private sector may need to be co-opted or requisitioned, preparedness arrangements for this eventuality need to be maintained.

Training

Training is obviously a most important component in preparedness. If possible, a permanent training system and program is desirable. This should cover not only the needs of government officials but also those of non-government organizations. In addition, training is required for persons (such as volunteers from within the community) who may fulfill or assist in disaster management roles during times of emergency. Exercises,

designed to test the disaster management system or parts of it, provide valuable preparedness needs. In training, as with so many other aspects, the existence of a permanent disaster management section or office is invaluable.

Public Awareness and Education

An aware, alert and informed public is a most valuable asset for preparedness. Public awareness programs can be presented in a variety of forms, to suit particular circumstances. Events such as a National Disaster Preparedness Day are helpful in promoting and sustaining public awareness. Inclusion of disaster awareness in school programs usually have long-term value.

Effects of Crisis Pressure

Disaster impacts usually impose various forms of crisis pressures on organizations and individuals who have to deal with the problems caused by it. It is difficult to simulate this crisis pressure in exercises or tests. Therefore, in formulating preparedness measures, it is advisable to take account of crisis pressure and, where possible, to try and compensate for it. This might be done by earmarking additional stand-by personnel, arranging for mobility in switching resources from one area to another, or similar measures.

3. Maintenance of Preparedness Levels

The maintenance of effective levels of preparedness is a major problem, especially because preparedness will tend to fade away if left to itself. Certain activities and arrangements help to maintain the viability of disaster plans. These are summarized below:

- Training activities
- Exercises and tests
- Functional and readiness checks
- Post-disaster review
- Use of regulations
- International assistance liaison
- Public awareness activity
- Publicity
- Education in schools

However, there are usually two particularly key areas which, in most countries, can significantly influence preparedness levels. These are:

- The lead given by the main national disaster risk management authority (*e.g. the National Disaster Council or its equivalent*).
- Astute utilization of the outreach capability possessed by most of those non-government organizations which have a disaster-related capability and role.

In many countries, particularly over recent years, non-government organizations (*NGOs*) have played an increasingly prominent role in disaster risk management, especially in preparedness and response. Many governments have realized that, because of restrictions in their own resources, it is beneficial and effective

to make optimum use of the religious and welfare organizations which comprise the majority of disaster-related NGOs, because these have a very strong out-reach and contact capability as far as the general public is concerned. In addition, NGOs of this type have strong links internationally. It follows that these two capabilities of out-reach strength and international linking provide an excellent basis for promoting community awareness and preparedness.

Linking and programming can be achieved between the official disaster risk management leadership and the ongoing activities of NGOs, there is every prospect of developing and maintaining good standards of preparedness.

Funding

Whereas the financial requirements of prevention and mitigation are largely self-evident, this aspect is sometimes overlooked with preparedness. Effective preparedness programs do require adequate budgetary support and, for this purpose, international assistance can often be obtained (*e.g. for training, communications, warning systems*).

Warning Aspects

Warning has sometimes been described as the critical "hinge factor" in disaster risk management. In other words, it provides the vital link between preparedness measures and response action. From a preparedness viewpoint, therefore, the following aspects are of key importance:

- The Warning system, and its associated procedures, must be clearly defined and written down in plans, standard operating procedures and all other relevant documents.
- The warning system must be known to and understood by all key government, Ministers, disaster risk management organizations and officials, other relevant persons and the general public.
- The system must possess the capability for:
 - *Receiving international warning*
 - *Initiating in-country warning, and*
 - *Issuing warning at national and other governmental levels, and at Community level*
- The system must also include back-up measures, in case its primary components fail or are damaged
- Intended recipients of warning (e.g. key persons and organizations and the general public) must possess the means of receiving the warning and must know what action should be taken.
- All facilities and arrangements relevant to warning and the warning system (e.g. evacuation arrangements, shelters and safe havens) must be in an appropriate state of readiness to react to warning.
- Arrangements for activation and mobilization of resources must be in place in order to make maximum possible use of any warning period.
- All plans and arrangements for disaster response must make provision for no-warning situations (e.g. for an earthquake or volcanic eruption where no prior warning indicators have occurred).

Session M.4.2:

Early Warning System

Nothing can stop the destruction caused by earthquakes, volcanoes, droughts or famines, but a range of early warning systems are helping people everywhere prepare for these natural hazards.

Early warning means the transmission and effective / timely dissemination of the message about any imminent danger that enables communities for taking preventive measures to avoid or reduce the possible losses of the danger.

An effective early warning is necessarily hazard and audience-specific that gives advice to the people for possible actions in advance, and the consequences of not taking appropriate measures.

The early warning is given to disaster prone communities to inform them about the looming hazard, the risks involved and elements at risk, environment, and potential needs for them.

The warning usually advises on the following issues:

- Means of protection (for instance, warning on contamination of water sources either from natural or human made activities)
- Means of preparedness (for instance, severe weather forecast / warning, preventive evacuation etc.)
- Means of mitigation (for instance, sandbagging to reinforce the dike / embankment)
- Means of response to threat (for instance, warning that the floodwater is about to hit the dike and cause breach; that the communities need to reinforce the dike through sandbags or other available means)

The early warning message also instructs on “what, when, how, who, and where” to help people effectively deploy their resources.

Different forms of giving / receiving warnings:

- Community meetings
- Notices / posters
- Verbal or pictorial messages
- Radio
- Community-based newspapers
- TV
- Other indigenous means

Inform people about different phases of the warning and its meanings; give update of the forecast through symbols or sounds that are understandable to locals.

For larger dissemination of the message / warning updates, “Information Boards” can be placed at various important locations such as:

- Schools or government buildings
- Stores / bazaars
- Bus / wagon stands
- High-raised places of a particular community
- Outside mosques / churches / other religious places

Formation of village level committees: With the assistance of government departments and NGOs, an information committee may be constituted for dissemination of information pertaining to warning / forecast or the monitoring of natural or man-made hazards. The committee can further assign primary and secondary roles and responsibilities to individuals and groups.

Sample Warning Template

Based on the latest warning received from the Met Department, floodwaters are expected to reach our area within next 24 hours, which would flow through the main village settlement and surrounding localities. According to the Met Department, this is going to be a severe flood as compared to the last one, which destroyed houses and crops, and killed animals.

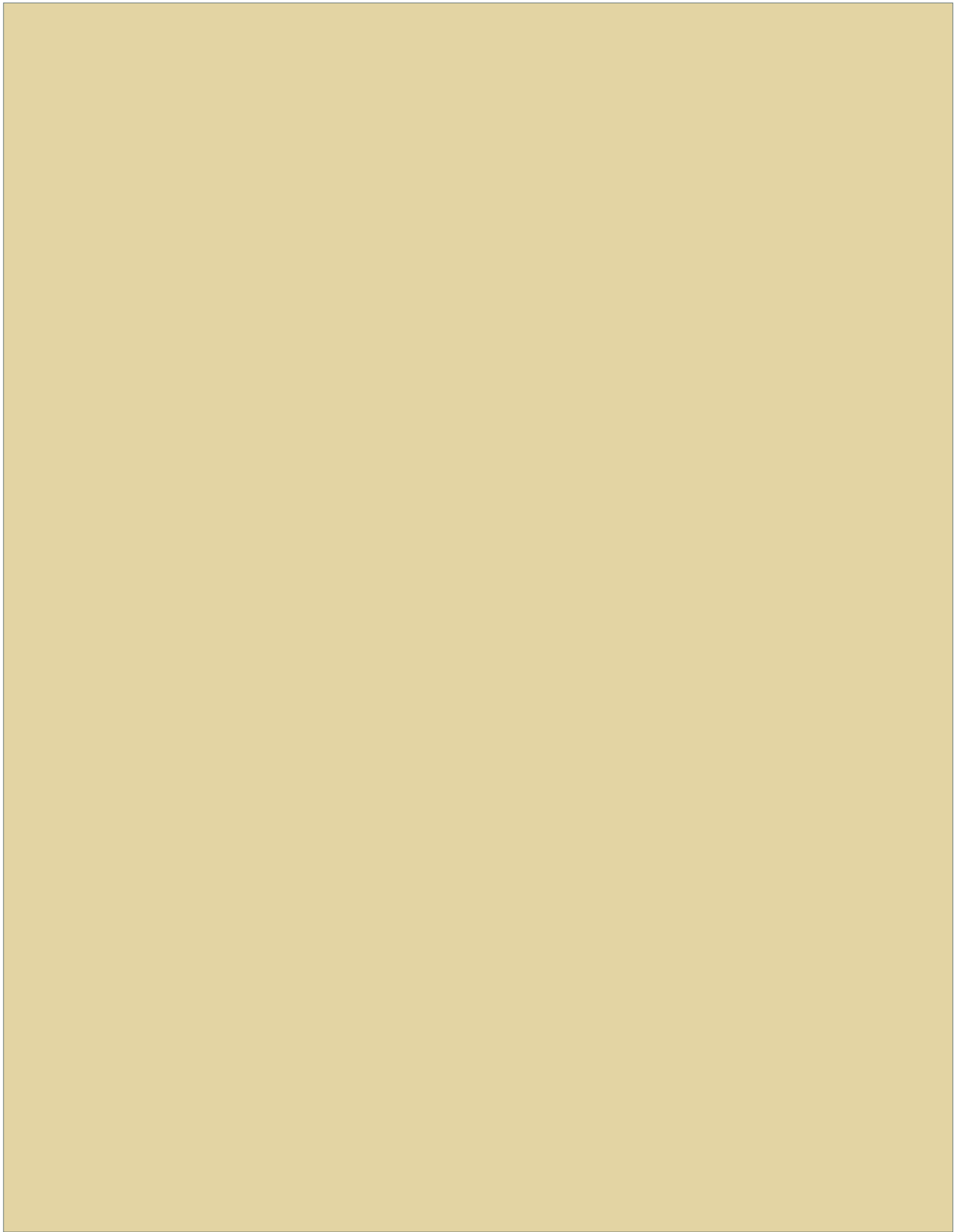
Therefore, all residents of the area are advised to evacuate to their designated evacuation centers. Please bring food, cooking utensils, bed-sheets and water and other valuables that are likely to be damaged by the floodwaters.

We have three hours to prepare before our organized evacuation. After necessary preparations, please proceed to the place where vehicles are waiting to pick all of us for evacuation centers.

It is estimated that the floodwater would recede within three days, and we would be able to get back to our homes on July 5.

Module 5: **Emergency Response Management**





Session M.5.1:

Emergency Response Management

Resiliency: "First is robustness, meaning a society continues to function during a disruption. Second is resourcefulness, which means managing the response to a disruption as it unfolds. Third is rapid recovery, or a society's ability to quickly get things back to normal after the disruption. Fourth is the ability to absorb new lessons learned from the disruption."

By: Eric Holdeman: Emergency management in the blogosphere, <http://www.emergencymgmt.com>, 2008

1. Important characteristics of Response

Effective response to the impact of disaster is critical, mainly in order to:

- Limit casualties,
- Alleviate hardship and suffering,
- Restore essential life support and community systems,
- Mitigate further damage and loss, and
- Provide the foundation for subsequent recovery.

There are certain characteristics which typically apply to response effort. They include the following:

Type of disaster

Depending on its type, the onset of disaster may provide long warning or no warning to all. This will obviously influence the effectiveness of activation, mobilization and application of response effort.

Severity and extent of disaster

This represents the size and shape of the response problem and particularly affects aspects such as:

- The ability of response effort to cope with the problem;
- The urgency of response action and the priorities which are applied;
- Exacerbation of disaster effects if appropriate action is not taken;
- Requirements for external assistance.

The ability to take pre-impact action

If warning time and other conditions permit pre-impact action to be taken (in the form of evacuation, shelter and other protective measures), this have a major effect on the success of response overall.

The capability for sustained operations

A frequent requirement of response operations is that they must be sustained over a long enough period to be dully effective. Several factors are involved here, including:

- Resource capacity,
- Management,
- Community self-reliance,
- International assistance.

However, the capability to sustain operations, relative potential threat, is a disaster management objective which needs to be carefully addressed both during preparedness and response action itself.

Identification of likely response requirements

An important characteristic of response is that it is generally possible to identify beforehand the kind of response action which is likely to be needed for any particular disaster. As indicated earlier the disaster threat and the effects likely to emanate from individual disasters are well established. Thus, the required response actions are also identifiable. This represents a considerable advantage in emergency response terms, in that it is possible to plan and prepare for well-defined response action in the face of potential threats. This, again, constitutes a tangible objective for management of emergency response. The assessment of response needs in the light of the foregoing and similar factors has useful application to most circumstances.

2. Requirements for Effective Response

Wide international experience has shown that effective response depends fundamentally on two factors;

- Information, and
- Resources

Without these two vital components, the best plans, management arrangements and expert staff become virtually useless. Bearing this fundamental premise in mind, the major requirements for effective response are summarized below.

General background of preparedness

The effectiveness of response operations will depend vitally on the general background of preparedness which applies. This includes various aspects of policy direction, planning, organization and training.

Readiness of resource organizations

The readiness of resource organizations (both government and non-government) to respond to disaster situations, often at very short notice, is a very important requirement for response operations. Sometimes, failure on the part of only one designed organization may seriously upset the total response effort. However, disaster management authorities do need to bear in mind that the response lead-time for resource organizations can differ markedly.

Warning

As has been emphasized earlier, an effective system of warning is vitally important for successful response operations; even though there are bound to be some occasions when little or no warning will be available. The main needs for warning are:

- Initial detection, as early as possible, of the likelihood that a disaster will occur.
- Origination of the warning process as early as practicable, bearing in mind false or Unnecessary warning needs to be avoided. In this regard, however, precautions can be built into the warning sequence by ensuring that, where doubt exists, only key officials are initially informed.
- Effective means of transmitting warning information.
- Facilities to receive and assess warning information.
- Response decisions, as a result of assessing warning information.
- Dissemination of response decisions and, as appropriate, broadcast of warning information to the public.

Preliminary reaction to warning, before a disaster actually strikes, can save lives and property. This preliminary reaction might include:

- Closing of schools, offices and other public places,
- Checking emergency power supplies and similar facilities,
- Taking precautions in households to ensure supplies of food and drinking water.

It is re-emphasized that preliminary reaction of this kind should be planned beforehand and, where necessary, the relevant information should be passed on to disaster related organizations and the public. The evacuation of communities, groups or individuals is a frequent requirement during response operations, evacuation is usually:

- *Precautionary* (in most cases undertaken on warning indicators, prior to impact, in order to protect disaster-threatened persons from the full effects of the disaster)
- *Post-impact* (in order to move persons from a disaster-stricken area into safer, better surroundings and conditions).

The question of evacuation is a complex one which involves a wide range of factors.

Activation of the response system

For rapid and effective response, there usually needs to be a system for activating emergency response officials and resource organizations. It is useful to implement activation in stages. These might be alert, stand-by and action. The benefit of this arrangement is that if, after the initial warning, the disaster does not materialize, activation can be called off. Thus, full mobilization of resources can be avoided and minimum of disruption is caused to normal life. It is advisable for government departments and other resource organizations to work this system of different stages into their own internal plans.

Co-ordination of response operations

Co-ordination of the action taken in response operations is very important. Good co-ordination ensures that resource organizations are utilized to best effect, therefore avoiding gaps or duplication in operational tasks.

Appropriate emergency coordination centers are essential for achieving effective co-ordination, because the ECC system is designed to facilitate information management and accurate decision making.

Also, appropriate disaster risk management committees (usually at national, intermediate, local government and community levels) are necessary, in order to ensure that, as far as possible, there is overall co-ordination in decision making and in the allocation of tasks.

Communication

As with all aspects of disaster risk management, good communications are essential for effective response. Also, since communications may be adversely affected by disaster impact, reserve communications (with their own power supplies) are a necessary part of response arrangements. The value of solar-powered communications, essentially under severe disaster conditions, can be considerable.

Survey and assessment

It is virtually impossible to carry out effective response operations without an accurate survey of damage, and consequent assessment of relief and other needs. To be fully effective, survey and assessment needs to be carefully planned and organized beforehand. It usually calls for:

- Survey from the air,
- Survey by field teams,

Accurate reporting from emergency response and other official authorities in or near the disaster area. A general survey needs to be made as early as possible after impact, with follow-up surveys as necessary. Some training is usually required for personnel who are required to carry out survey and assessment duties. This is necessary in order to ensure the accuracy of collected information. The information gathered through survey and assessment is, of course, vitally important for the implementation of immediate relief measures. However, it should also be noted that much of the information is also required for the formulation of recovery programs.

Information Management

In the confused circumstances which tend to exist following disaster impact, it is not easy to obtain accurate and complete information. However, without accurate and comprehensive information, it is difficult to ensure that response operations are focused upon the correct tasks, in the right order of priority.

Emergency coordination centers are essential for effective information management. ECCs especially ensure that information is correctly processed according to the proven cycle of:

- Acquisition of information,
- Information assessment,
- Decision making,
- Dissemination of decision and information.

Therefore, even if there are limitations in obtaining information, the ECC system will make the best use of what is available.

Allocation of tasks

Through proper preparedness planning a majority of response tasks can be designated beforehand to

appropriate government departments and other response organizations. For example

- Public works department to undertake debris clearance tasks.
- Medical and health department to implement health and sanitation measures.
- Police to maintain law and order, and to assist with control of people and vehicles around the disaster area.
- Red Cross to carry out first aid and other emergency welfare assistance.

The emergency response authority may need to give especial attention to tasks such as emergency feeding and emergency shelter programs, which are not covered in the day to day responsibility of government departments and other organizations.

Priorities for the implementation of response tasks are usually decided by the appropriate level of disaster committee. These priorities may have to be changed frequently and both emergency response authorities and resource organizations need to be capable of accepting and implementing such changes.

Availability of relief supplies and committees

The ready availability of relief supplies and commodities is an important factor in effective response. After disaster impact, there is usually an urgent need to provide and distribute:

- Food,
- Drinking water,
- Clothing,
- Shelter materials,
- Medical supplies and assistance.

Emergency response action therefore needs to cover two main areas

- Obtaining the various commodities from government stores, emergency stockpiles, commercial supplies and international assistance sources; and
- Organizing the distribution of these commodities according to the best possible orders of priority.

International Assistance Resources

International assistance resources often play a valuable part in response operations. These resources mainly comprise relief commodities, especially food, shelter and medical supplies. However, specialist personnel and equipments are also available for damage survey and similar tasks. Emergency management authorities responsible for response operations should also bear in mind that some international agencies and some countries hold stockpiles of relief supplies conveniently situated around the World. Access to such stockpiles may be extremely valuable in times of urgent need.

Public Co-ordination

Good coordination between the emergency response authorities and the public is essential if response operations are to be successful. The foundation of such cooperation should be laid during the public awareness programs as part of preparedness. However, emergency response and coordinating authorities

should remember that the affected public needs to be kept informed. This particularly applies to intended response action and the timing of relief supplies. If the affected public is not kept, as fully informed as possible, rumors and false reports are likely to be started, thus causing problems of co-operation for the response authorities.

Media Cooperation

Disaster, especially major disaster, is news. Consequently, requirements for information by local and international media are inevitable. Thus, it is clearly advisable to have well-organized arrangements to deal with this aspect. It is important that conditions in the affected country should be accurately reported internationally and that there is no misreporting. Therefore, to avoid possible misunderstandings and misrepresentations, it is important to give appropriate briefing and information to media representatives about disaster impact. Delays may lead to some media representatives making their own news, which may not be in the best interests of the country. Good relations with the local media are also important and usually two-way benefits are involved. Not only do the local media benefit from good cooperation from the disaster risk management authority, but they can also perform valuable services such as warning and public awareness.

It is recognized that during pressurized response operations, disaster management authorities may regard media information as having to take a low priority. However, this should be avoided.

3. Major emergency response aspects

Following the impact of disaster, there are usually varying degree of damage to the systems which support everyday life. Communities therefore need help urgently in order to subsist through the emergency phase and beyond. Key aspects of this assistance include:

Response

To rescue persons who may be trapped in buildings and under debris, isolated by flood waters, or need rescuing for any other reason.

Treatment and care of victims

To dispose of the dead.

To render first aid.

To ensure identification tagging of casualties.

To ensure needs in term of medical treatment, hospitalization and medical evacuation; or whether such a requirements is likely to arise later.

Shelter

To provide shelter for victims whose housing has been destroyed or rendered unusable. This may involve:

Making urgent repairs to some housing,

Issuing tents and/or tarpaulins to provide means of temporary shelter,

Accommodating groups of homeless people in community building such as schools.

To organize and distribute food to disaster victims and also emergency workers.

To estimate damage to food and food stocks.

To estimate food reserves available (including un-harvested crops)

Clearance and access

To clear key roads, airfields and ports in order to allow access for vehicles, aircraft and shipping; also to prepare helicopter landing sites.

Water and power supplies

To re-establish water and power supplies or to make temporary arrangements for them. The provision of potable water is often difficult, particularly in the immediate aftermath of disaster. Water purifying equipment might therefore have to be obtained and/or water purifying tablets issued.

Temporary subsistence supplies

To provide supplies such as clothing, disaster kits, cooking utensils and plastic sheeting, so as to enable victims to subsist temporarily in their own area to reduce the need of evacuation.

Health and Sanitation

To take measures to safeguard the health of people in the stricken area and to maintain reasonable sanitation facilities.

Public Information

To keep the stricken community informed on what they should do, especially in terms of self-help. To prevent speculation and rumor concerning the future situation.

Security

To maintain law and order, especially to prevent looting and unnecessary damage.

Construction requirements

To estimate high priority building repair and replacement requirements.

Disaster welfare enquiry

To make arrangement to handle international and national enquiries concerning the welfare of citizens and residents, including tracing of missing persons.

Maintenance of public morale

Depending on cultural and local circumstances, to make arrangement for counseling and spiritual support of the stricken community. This may involve religious bodies, welfare agencies and other appropriate organizations.

Other requirements

Depending on individual circumstances, other requirements, additional to those above, may arise.

4. Period of response operations

Wide international experience indicates that most governments find it expedient to keep the period of emergency response operations down to a fairly limited period. This period usually tends to be 2-3 weeks, after which remaining relief and associated needs are met through the normal systems and processes of government. Undue extension of the emergency is usually regarded as undesirable in order to avoid:

- Over-dependence on emergency aid (especially food supplies),
- Adverse effects on the local commercial system, and
- Unnecessary delay in returning to normal community life.